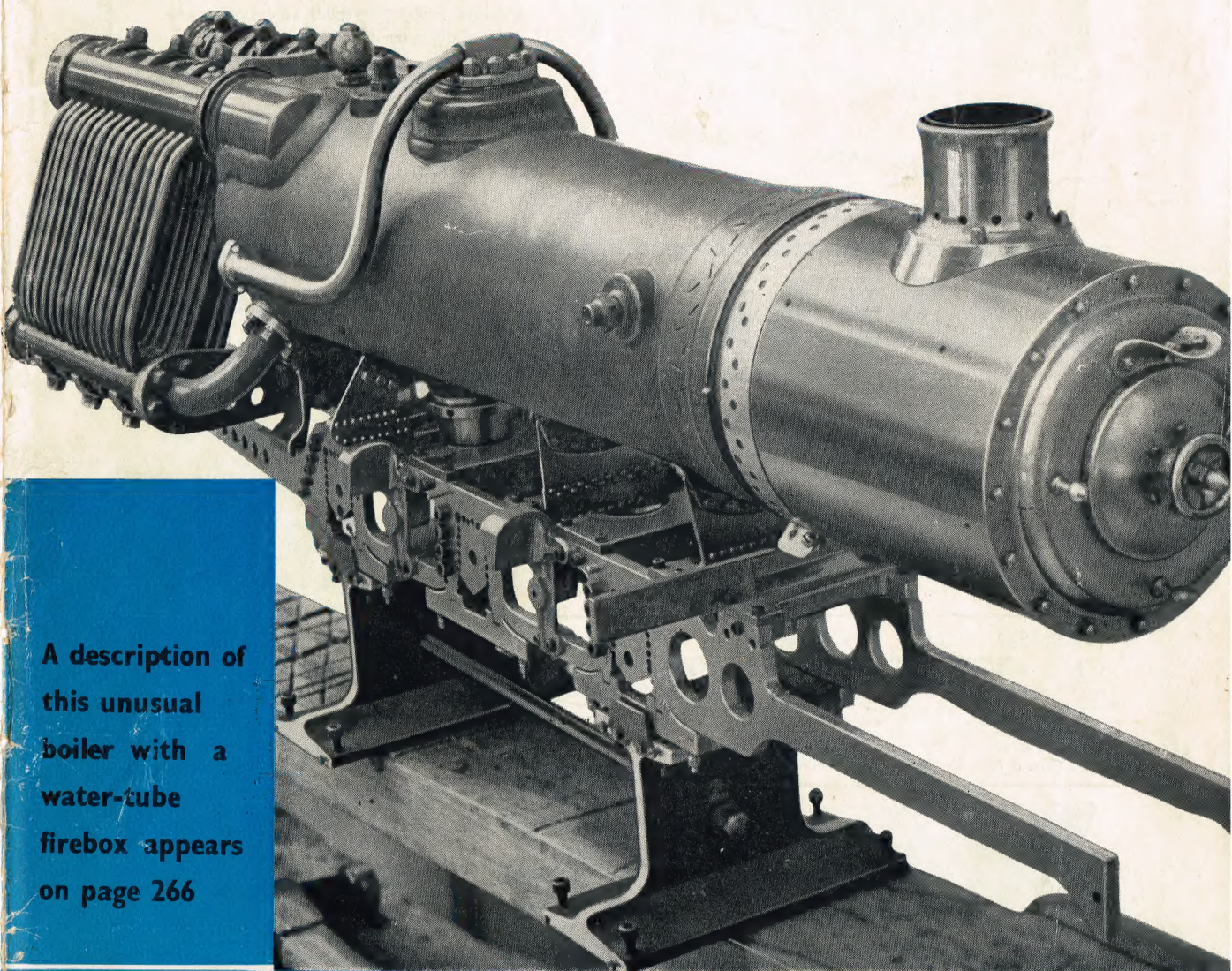


25 VJH

# ***Model Engineer***

**THE MAGAZINE FOR THE MECHANICALLY MINDED**

## **An experimental boiler**



A description of  
this unusual  
boiler with a  
water-tube  
firebox appears  
on page 266

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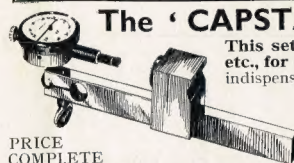
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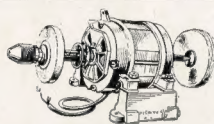
## The 'CAPSTAN' 5x INDICATOR SET

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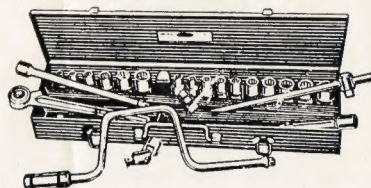
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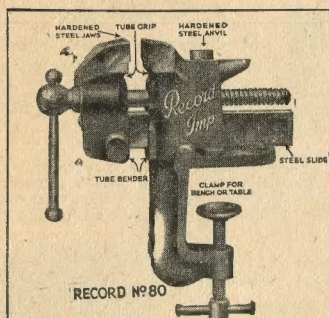
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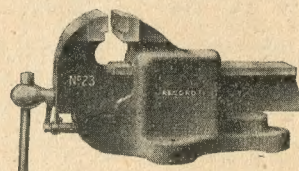
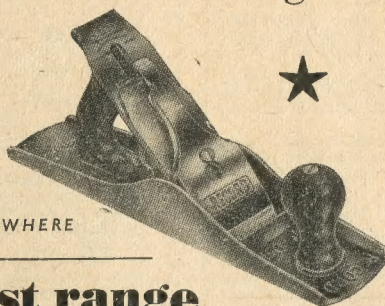
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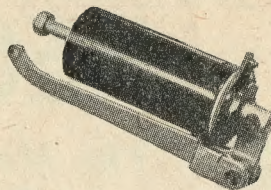
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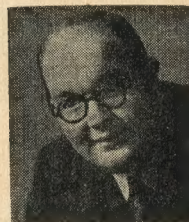
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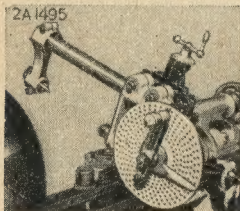
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**Question:** What are basic needs?

It depends entirely on the field you wish to enter—certainly we do recommend you to make haste slowly with non-essentials—a good way is to weigh each item in terms of regular usability against cost. Having made a good start (see items mentioned above) the rest can follow, paying due regard to the normal desire to make for yourself. Price lists gladly on request.

**Question:** What does it cost?

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**Question:** Do you make enquiries?

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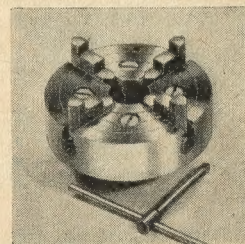
**Question:** How do we pay?

Monthly: (1) by post, (2) by written order on your Bankers if desired, or (3) at our counter.

**Question:** May we buy accessories only?

All the foregoing is equally applicable

to lathe accessories, attachments or indeed any item in our range. List those urgently required MYFORD Attachments and send it for our quotation—you'll be agreeably surprised.

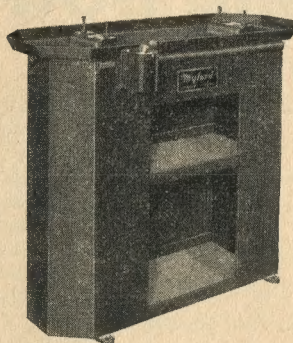


**Question:** How about times of sickness?

For a very nominal sum every transaction can be covered by Security Insurance against accident, sickness or unemployment. Should the need arise our insurers take care of your payments for you—NOT a loan but permanent relief when it is most needed.

**Question:** May we have a recap?  
Certainly.

- (1) Write to us for MYFORD Lists.
- (2) Choose your MYFORD Equipment carefully—our advice is yours for the asking.
- (3) Send your list for quotation.
- (4) Why didn't I do this sooner!

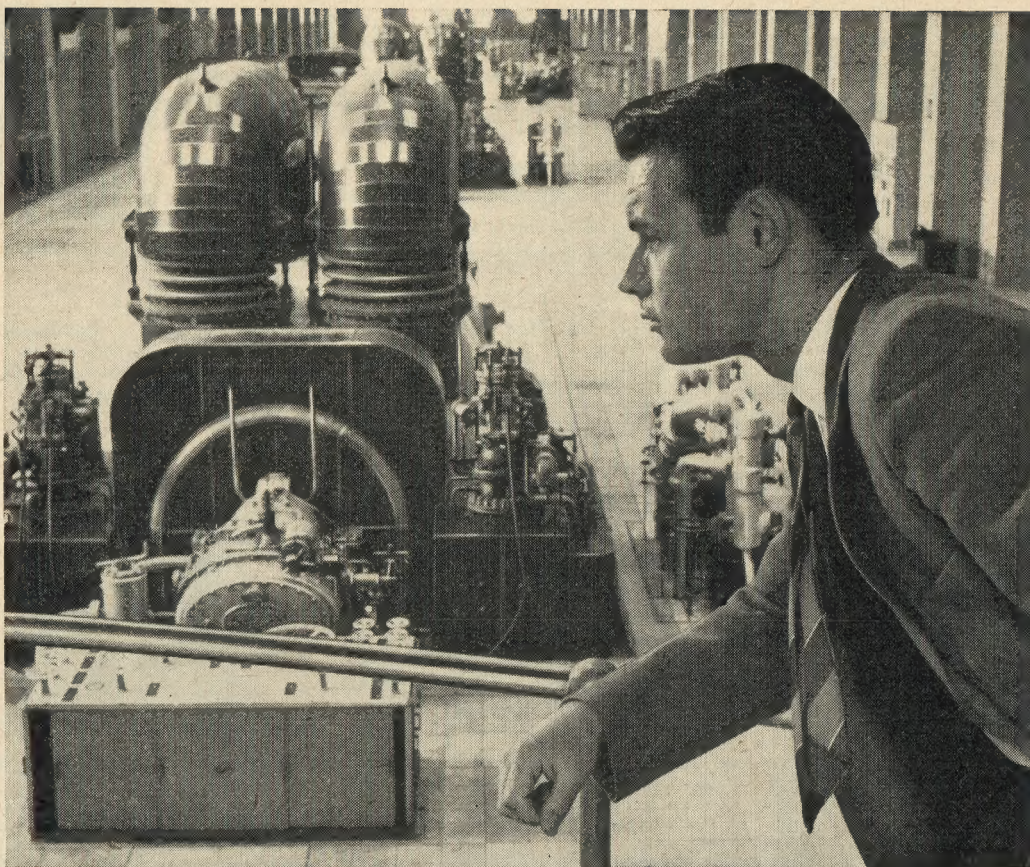


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# Model Engineer

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## A WEEKLY COMMENTARY

# Smoke Rings

By VULCAN

IS it an illusion or do electric trains ride differently to steam stock? I have travelled by train all over Britain and I have had many opportunities to compare the riding qualities of the rolling stock used by the different regions.

To my mind some of the best riding stock—and I am speaking of pre-standardisation days—was that on the main lines operated by the Midland Region. The coaches are substantial and sit squarely on the springs, the balance between sprung and unsprung weight being nicely calculated. Serious attention seems to have been given to the problem of spring periodicity, for none of the Midland coaches I have travelled in ever showed any tendency to dance.

## Swaying and yawing

The North Eastern "teaks" have a habit of swaying slightly at speed and some of them, particularly the vestibule type, take on a nautical characteristic and appear to yaw.

Yet despite the faults of rolling, rocking, pitching and juddering (found with some Eastern Region coaches when brakes go on suddenly) main line steam stock behaves very well.

Can the same be said of electric traction? Reflecting on the many journeys I have made on Britain's railways I cannot think of one occasion when travel by electric train has

been as smooth as that provided by steam. Even when one is travelling in a trailer coach there still seems a lot of swaying and dancing and rocking about.

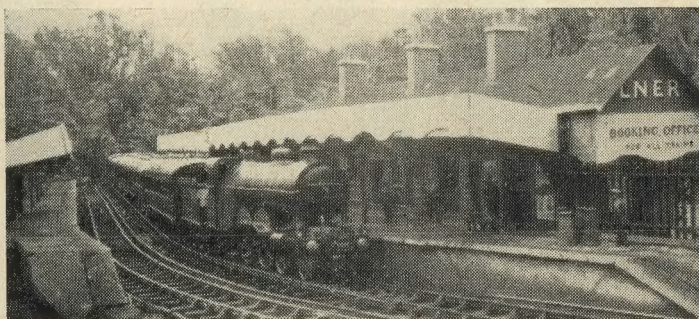
Whether this is induced by the forceful presence of the motor units, the condition of the track, or the design of the rolling stock I do not know. But I am quite certain that the ride is not as pleasant as that provided by steam.

## Realistic

RECENTLY, you may remember, I mentioned that some coal, suitable for use in gauge 1 locomotives, had come into my possession and I promised to send small quantities to live steamers who could use it. Among the replies I received was one from Mr K. R. Herring, of Cranleigh, who sent me a photograph of a GNR Atlantic on his extensive layout.

Mr Herring has gone to much trouble to capture the maximum amount of realism. The model passengers waiting for the train to draw to a halt, the milk churns with the attendant porter ready to load them, and the realistic concrete platforms add an authentic touch to this gauge 1 system. It is interesting to see how this picture angle causes the station to blend into the background giving a distinctly rural appearance.

Mr Herring has promised to let me know what results he obtains with the coal I sent.



A model of a Great Northern Atlantic on the layout belonging to Mr K. R. Herring, of Cranleigh

## Smoke Rings

CONTINUED

### Journal's new look

"WITH flywheels flashing fire and snorting in line abreast..." This is the description by *Punch* of a traction engine rally, an extract from which appears in *Steaming*, the journal of the National Traction Engine Club. This three-year-old journal, edited by the recently appointed editor the Rev. R. C. Stebbing, is now appearing in a much improved style.

One item which might give rise to argument is the decision of the NTEC committee to insist that all engines entered in an event organised by the club be passed by a boiler inspector and given a certificate of worthiness.

As one would assume, *Steaming* covers traction engine events up and down the country, with reports of club activities and news of the transfer of engines. It has a private circulation among the many members of the NTEC.

### Signal spectacles

REFERRING to the colour of railway signal lamp lenses, mentioned recently in our correspondence columns, I have just received an interesting letter on this subject from

a Mr Percy Rosewarne, who 50 years ago was cleaning signals on the old Great Central Railway and later on the North Eastern.

Mr Rosewarne says that in those days all the "green" lenses were of green glass, and it is only in recent years that blue has been used. He also gives it as his opinion that the original green glasses were better in fog, and in clear conditions they could be seen as much as two miles away. Mr Rosewarne sends some samples of these glasses, the older ones being no less than  $\frac{1}{8}$  in. thick.

One would expect that when put up against an ordinary tungsten light that the blue glass would appear green. I can say definitely that it does not. It still looks just as blue! Perhaps some reader can explain how the modern blue glass come to appear green.

### New appointment

MR S. L. SHEPPARD, for some years the hard-working secretary of the Society of Model and Experimental Engineers, has recently retired from his post with one of the Regional Boards of the National Health Service.

However, he will not be retiring from the model engineering scene; in fact, not only will he continue to pursue his secretarial duties for the SMEE, he will also serve the movement in a wider sense, for he has

### Cover picture

*The boiler of this  $\frac{3}{4}$  in. scale model of a transatlantic Pacific locomotive, which is described on page 266 by Mr Arthur Hughes, is of a completely freelance design and at present is still in the experimental stage.*

been appointed manager of the Model Engineer Exhibition.

This vacancy was created when Mr A. J. Kreps, who had been with Electrical Press Ltd for 24 years, left to take up a similar appointment with Link House Publications.

In wishing Jim Kreps, as he was familiarly known to us and the thousands who flock to the exhibitions, every success, we also welcome Mr Sheppard to the fold at Noel Street. He takes up his duties on March 16.

Mr Sheppard has a great deal of experience and tradition behind him in connection with our annual event and I am sure his appointment will prove a popular one with model engineers.

### Lord Mayor drives

WHEN the Lord Mayor of London, Sir Harold Gillett, attended a children's party held by the Honourable Artillery Company at Armoury House, City Road, London, he made use of the opportunity to try his hand at driving the miniature steam locomotive provided for the entertainment of the boys and girls.

The layout, 124 ft long, was loaned by the North London Society of Model Engineers, the rolling stock comprising a 5 in. gauge GN Atlantic, built by Mr J. E. R. Windart, and two trucks.

Mr G. M. Cashmore, chairman of the NLS, told me that this is the fifth year his club has taken its portable track to the HAC's children's party. He estimated that something like 500 children were given rides at this year's event.

### Next week

THE second instalment of the short series by Mr M. C. Lloyd, describing the building and operation of his narrow gauge railway, will appear in the issue for March 5.

Edward Bowness continues with his informative articles for the aspiring ship modeller; and Edgar T. Westbury, describing the construction of the 30 c.c. four-cylinder four-stroke Sealion, deals in the next issue with the crankshaft and connecting rods.



The Lord Mayor of London, Sir Harold Gillett, driving a model 5 in. gauge Atlantic locomotive at the children's party organised by the Honourable Artillery Company

# ARC WELDING

**Successful electric arc welding is a highly skilled operation, the nature of which, says J. W. COOPER, is often imperfectly understood by the amateur**

**T**HE main questions about electric arc welding appear to centre on welding voltages which are not fully understood by the amateur. It is frequently stated that between 80 and 100 v. is necessary for welding. Though this is perfectly correct, it is not the actual voltage of the arc—it is the open circuit voltage of the apparatus. The voltage at the arc will be lower than this.

As with other apparatus, certain conditions must apply if successful results are to be obtained. To understand what happens, it is necessary to have some idea of what takes place when an arc is struck. A source of energy is connected to two electrodes. These are brought together and then separated and an arc is formed.

At the moment of contact the circuit is in a state of short circuit and if conditions were such that the voltage remained at full pressure, it would be dangerous to attempt to start an arc. To do this successfully it is necessary to reduce the voltage at the moment of contact, raise it after the electrodes have been separated, and then stabilise the arc. There are several ways in which this can be done. One is to use a resistance in series with the arc. But in practice this is unsuitable because it would be impossible to carry out any form of hand control. From this it will be seen that some form of regulation is required in the welder itself, and it is provided in its design.

## The arc voltage

Whether an arc is used as a source of heat or lighting, as in a lamp, there is a definite arc voltage. It is a varying voltage somewhere between 30 and 45 v. As the current across the arc increases, the voltage tends to drop. To keep things in a workable state, the circuit voltage must be increased to balance things. If the circuit

voltage remained at a fixed value and the current was progressively increased, a point would be reached where the arc could no longer be maintained. It follows that some form of control must be available to vary the voltage.

Voltage regulation could be carried out by a series resistance or a choke coil. But as the voltage fluctuates considerably, this would not be practicable. Welding appliances are, therefore, designed to do the regulation automatically. In welding apparatus the generators and transformers are of a special design with a character-

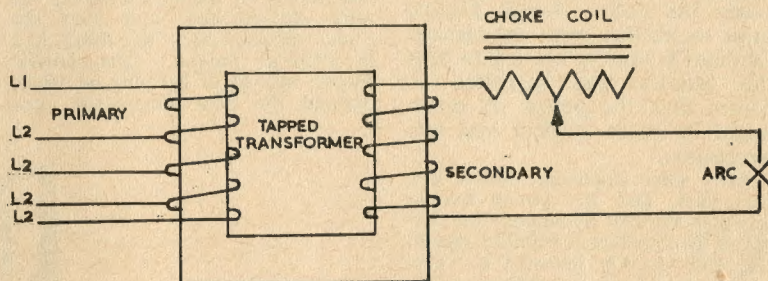
generators could be described as having bad regulation because as soon as a load is put on the machine the voltage drops to a low value, whereas with a normal generator, the voltage would remain practically constant regardless of load.

This drooping effect is obtained in several ways; one is by use of armature reaction and field distortion, the field poles having a special shape. Another method is to connect the series field coils in opposition to the main field. Current flowing in the series coils will reduce the shunt field magnetising current and so reduce the machine's voltage. With alternating current, the transformer is designed to have a certain amount of magnetic leakage. This produces the drooping feature, the coils being wound on separate limbs of the iron-work.

## Auxiliary control

Apart from the variable feature of welding apparatus, some form of auxiliary regulation is used to give a single unit a wide application. The regulation is provided by using separate resistances or choke coils in the arc circuit.

Choke coils used with welding transformers are of two styles. One is the simple solenoid with a sliding



TYPICAL WELDING CONNECTIONS

istic peculiar to this kind of equipment.

Both generator and transformer have what is known as a "drooping" characteristic. The effect is to create a falling voltage that varies in accordance with the load. When striking the arc, the voltage immediately falls to a suitable value and when the arc is established, the voltage adjusts itself to the arc and adjusts the regulation generally throughout the welding run.

Where direct current is used, the generators are special machines and do not function in the same manner as an ordinary generator. These

core, the other is a fixed choke coil arranged to have tapings on its winding. These chokes are usually constructed as a transformer. But an open-core type could be used just as well with the core fixed in position and tapings brought out in the same way. The choke coil can be a separate unit, or, as in normal practice, it can be built into the transformer housing to make a compact unit.

Welding transformers are rated in accordance with the duty they will perform. Usually they are short rated. This means that the apparatus can be operated at full load only for a limited time, before it reached a

## ARC WELDING

continued

dangerous temperature. These high ratings are helpful to the designer because they enable a greater output to be had from a given amount of material as against a normal rating. A copper conductor is normally worked at 1,000 amps for 1 sq. in. of cross-section. With some ratings, currents up to and over 4,000 amps can be safely used. Good ventilation is necessary for transformers and other generators. Most static gear is oil-cooled, the whole assembly being fitted in a suitable tank.

There are instances where it is stated that welding can be carried

out with 12 or 24 v. Although, no doubt, a useful amount of heat could be had in this way, this is not welding in the true sense. If you bear in mind the ruling when attempting to strike an arc at these low voltages and under short circuit, it is doubtful if a true arc could be formed. If these low voltages could be used for welding, there would be no point in making and designing welding apparatus for a higher voltage. It would be a waste of time and materials.

The figures for amperage given below are taken from Murex Process Ltd, a leading firm of welding equipment makers:

Cast iron: depending on type of electrode, OC voltage 60 to 100. Typical currents: 14-gauge elec-

trode, 40 to 50 amp.; 12-gauge electrode, 60 amp.; 10-gauge electrode, 80 amp.

Steel: general purpose. OC voltage, 60 minimum.

Typical currents: 14-gauge electrode, 40 amp.; 12-gauge electrode, 90 amp.; 10-gauge electrode, 120 amp.

Special electrodes for thin sheet. OC voltage 80 to 100.

Typical current: 16-gauge electrode, 25 amp.

There are many kinds of commercial welder available, in price ranges to suit all pockets, and consideration of the facts given in this article should help the purchaser to decide what best suits his needs. □

## HISTORICAL STEAM ENGINES

### SYMINGTON'S STEAMBOAT, 1789

**P**ATRICK MILLER was a Scottish gentleman whose interest lay in experiments with double-hulled vessels, propelled by manually-operated paddles placed between the hulls. James Taylor, tutor to Miller's sons, experienced the hard labour of helping to turn the paddles, and suggested to Miller that the power of steam might be more efficient and less wearisome.

After some argument, Miller was persuaded, and the young mining engineer William Symington was engaged to construct a suitable engine. (He had recently invented a "new arrangement" of the steam engine, differing from Watt's in the disposition of the condenser.) The engine illustrated was duly erected in a boat 27 ft long  $\times$  7 ft beam, which it drove at 5 m.p.h.

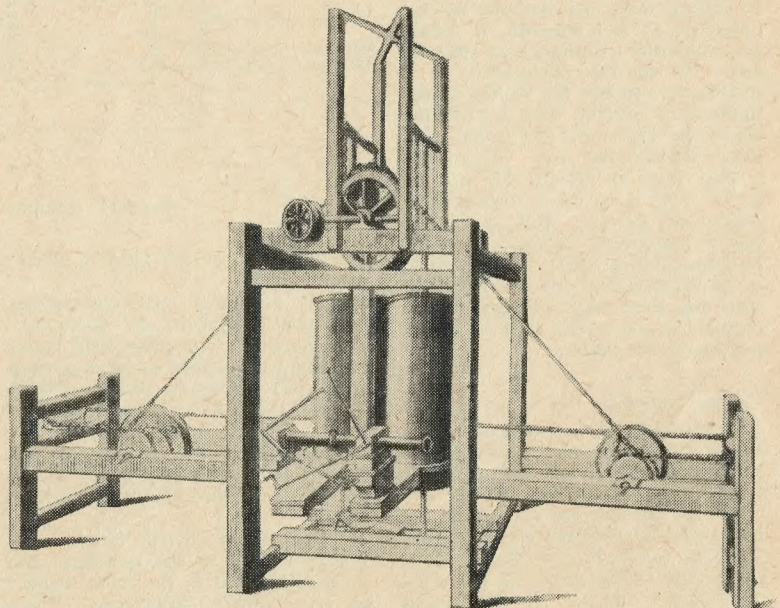
Erected on a timber framing, the engine had two cylinders 4 in. dia., the pistons driving upwards to cross-heads to which chains were attached, the chains also being wrapped round a large pulley. Thus as the rods rose and fell, so the pulley rotated. A second chain wrapped round it transferred the motion to the rod-and-chain system seen, thus oscillating the two lower shafts on which the two paddles were mounted. The paddles were driven by an ordinary ratchet motion similar to a cycle free-wheel.

Satisfied with the first attempt, Miller decided to build a much larger vessel with a similarly enlarged engine,

having twin cylinders of 18 in. dia. The same driving arrangements were employed, and the vessel was tested on the Forth and Clyde Canal in November-December 1789. The paddles broke on the first attempt, but were strengthened, and then the chains broke, after the boat had travelled at 7 m.p.h. The choleric Miller, instead of carrying on trials, ordered the boat dismantled, pro-

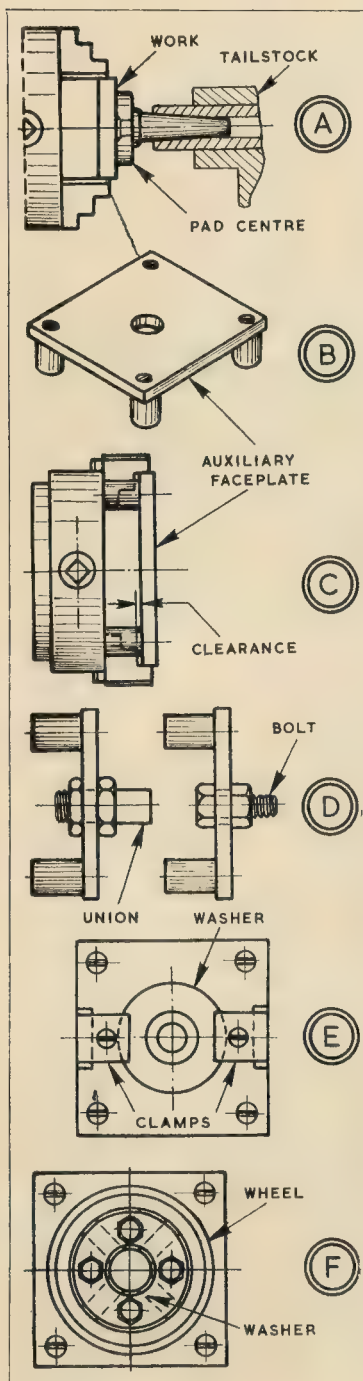
nounced Symington's engine "the most improper of all steam engines for giving motion to a vessel," and dropped the idea of steam navigation completely.

The engine itself was stored for some years, and was nearly scrapped. However, it was renovated by John Penn and Son in 1856, and taken to what is now the Science Museum in January 1857.—W. J. HUGHES.



# Simplifying setting-up

By GEOMETER



A NUMBER of operations performed on the lathe prove awkward in the setting-up stage, not because the parts are complicated, but because they are narrow, small, flexible, or with features not in agreement with standard equipment and methods. Often the work consists of odd jobs or corrections which can be time consuming, though certain production operations are not excluded.

It is not easy, for example, to grip a thin washer in the chuck to drill or bore out the centre; and a set-up for facing the threaded end of a bolt or screwed fitting can be difficult if a hold has to be obtained on a hexagon or narrow flange; and where it would be practicable to mount a screwed fitting in a threaded mandrel, it may not be possible to do so because the appropriate tap is not available.

Two lathe fittings providing facilities in this odd-job type of work are the pad centre for the tailstock, and the auxiliary faceplate which can be held in the four-jaw independent chuck. The pad centre, as at A, will square the face of any narrow part that can be gripped in the chuck. It can also be used to align and apply pressure to work which can be drilled on the lathe (drill in the chuck) as an alternative to the bench drill.

## Using auxiliary faceplate

The auxiliary faceplate, as at B and C, furnishes a ready mounting for small parts that can be clamped—but not on the ordinary faceplate, owing to the presence of the spindle. It has the advantage, too, that a part can be mounted on it on the bench and the faceplate then adjusted, regulating the chuck jaws to bring the part true, which is much easier than truing before clamps are fully tightened.

As machining from the solid would involve considerable work for a pad centre, a built up construction is advisable, employing a suitable disc and a shank turned with the taper to enter the tailstock barrel. The size of the disc is largely influenced by that of the lathe, but  $1\frac{1}{2}$  in. to 2 in. dia. is useful, with a thickness of  $\frac{3}{16}$  in. or  $\frac{1}{4}$  in. The disc can be screwed, riveted, brazed or welded to the shank

when the latter has been prepared; but if brazing or welding is adopted, finish-turning the shank may be left until afterwards. Finally, the shank can be fitted in the lathe spindle and the outside diameter and face of the pad machined true.

For a small lathe, a good size for the auxiliary faceplate is  $2\frac{1}{2}$  in. to 3 in. square, and  $\frac{3}{16}$  in. or  $\frac{1}{4}$  in. thick, mounted on four "legs"  $\frac{1}{2}$  in. or  $\frac{5}{8}$  in. dia. The length of these legs should provide clearance under the reversed jaws of the chuck, as at C, so the plate is located on the chuck face. Observation should be made of screw holes in the chuck face, and the plate and legs should be of a size to avoid obstruction in normal use. Both plate and legs can be mild steel. Ideal finishing for the plate would be surface grinding, though a piece of material reasonably true to start with could be filed and lapped. Legs faced to the same length, can be fixed by countersunk screws.

There can be a central hole in the plate for clearance when drilling, and for mounting parts like unions and bolts—with washers if required. For particular sizes, other holes can be provided near the centre (to minimise off-set on the plate) and holes for clamping bolts or screws can be drilled—and tapped—when necessary.

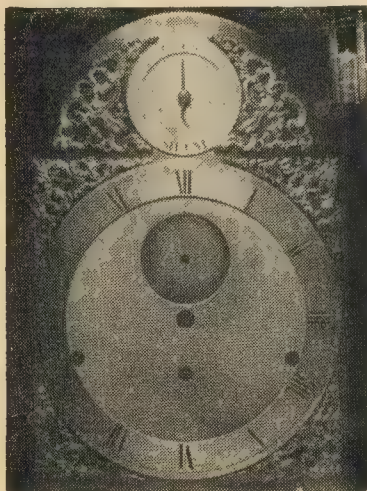
Typical uses are as shown. As at D (left), the second screwing operation on a double-sided union fitting can be done mounting it in the plate with a nut, then adjusting the plate for spinning truth. A bolt (right) can be similarly mounted for shortening; and parts like car tappets with sunken heads can be set up for surface grinding. For boring out a washer, it can be clamped as at E; and there should be a piece of cardboard behind it so that the tool clears the plate. Faced on the back first, a part like a wheel can be turned on the diameter and drilled and bored, set up as at F, using a suitable washer and bolts between the spokes. ■

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**R**EMOVE faceplate from the lathe and engrave the fine straight strokes of the figures. This should be done by hand engraving. A small square or lozenge-shaped graver is all that is required—one about  $\frac{1}{8}$  in. square section does very well. Whet it well on an oil stone. When right the point of the graver should dig into the back of one's thumbnail. It is better to sit on a low seat so that the work is just above eye level.

If the graver is sharpened correctly, practically no pressure is needed to follow the trough of the scribed lines. Cut from both ends of the figures if necessary. Inclining the graver to the left will make a broader but shallower cut, and inclining it to the right will make a deeper but finer cut.

The broad strokes of the figures are treated as follows: Drill a small hole through the middle of each broad stroke. Then, using a fine piercing saw, completely cut away the area of the stroke, keeping however, just within the scribed lines. With a fine flat-sided needle file true or justify all the margins cut by the piercing saw. The divisions on both the seconds dial and chapter ring can easily be done by hand engraving. Remove any burrs left by the engraving using a small piece of emery stick. The chapter ring and faceplate are then returned to the lathe, and the inner circumference of the chapter ring should be scribed and parted through. A slight chamfer on this edge will enhance the appearance of the chapter ring.



*The clock (hands not yet fitted) showing dial without the fret*

# A PERIOD CASE FOR THE ME MUSICAL CLOCK

**In this instalment, C. B. REEVE tells how to put the final touches to this elegant unit**

The chapter ring can then be removed from the faceplate. Some thin paper should be pasted on to the back of the chapter ring, and for convenience it can be replaced on the faceplate. A few drawing pins will hold it in position. The chapter ring is now heated with the bunsen burner, making it sufficiently hot to allow sealing wax to melt and run when contacting the metal.

Fill the engraving and pierced work with the wax, making no attempt to control its flow or position. When the engraving is sufficiently filled with wax, reheat the chapter ring, and with the edge of a piece of fine card (a visiting card is ideal) scrape away the excess wax. When cool, remove the chapter ring from the faceplate, place it under cold water and scrape away the remaining excess with a small piece of flat pumice stone. Care should be taken to keep the chapter well moistened with cold water.

## Silvering the chapter ring

The paper on the back of the chapter ring can then be taken off and any excess wax removed from the back of the ring. After drying the chapter ring replace on the faceplate, run the lathe at medium speed and grain the front surface of the ring with emery-paper—say No 1 fine or coarse No 0—wrapped around a piece of flat cork. Great care must be taken to ensure that the wax does not soften with the friction, as this would cause smears on the chapter ring. Remove the chapter ring from the faceplate without touching its front surface with the fingers. It is then ready for silvering.

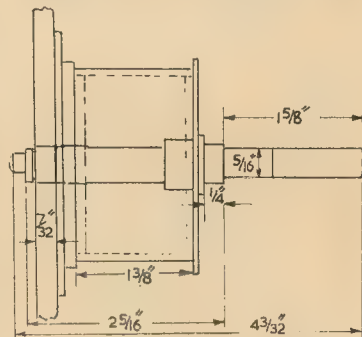
Get a small quantity of nitrate of silver crystals, say 2s. or 2s. 6d. worth, which is enough to silver several dials. Dissolve the crystals in half a tumblerful of water. Fill the tumbler with water and add a dessertspoonful of ordinary salt. The silver will fall to the bottom of the tumbler. After a few minutes pour off the water leaving the silver-chloride behind.

Refill the tumbler with water and stir up the silver-chloride to thoroughly

wash it. When it has settled again pour off the water. Do this three times to get rid of the acid. Finally the water is poured off, and the silver-chloride mixed with an equal quantity of cream of tartar and salt (proportions do not really matter). Well mix and the paste is ready to be used.

Rub the chapter ring all over with the paste, using either a piece of cotton pad or the fingers. I prefer the fingers. It must be fairly quickly applied with a circular movement. At first it will go black and cloudy, but on continuing the treatment it will eventually turn to a nice white surface of silver. Nothing is gained by applying an excessive amount of paste because this is a chemical action and the brass surface will only absorb a limited quantity of the silver.

When an even surface has been obtained, rinse the ring with warm



*Further details with clearer dimensions of the barrel arbor*

water and with a small brush, clean out the corners of the engraving and any screw holes. This is very important, as any paste left on the chapter ring causes dark spots to appear. If this happens, it can be removed with cotton-wool dipped in water and cream of tartar. For this reason it is better to leave the lacquering for a week or so.

To lacquer the chapter ring, use clear lacquer known as "Sprayt" made by M. Munster Developments Co., of Fulham, SW. The lacquer

should be diluted to about half strength with amyl acetate, and applied quickly but sparingly, or the wax will "cry" and spoil the appearance of the ring.

The letters on the chime/silent ring are marked out in the same way as those on the chapter ring. They are then carefully cut through with a fine piercing saw. To get good results go carefully as the letters are too small to be trued up after the cutting with a needle file. The letters are filled with the wax in exactly the same way as the chapter ring.

The brass dial plate is polished and lacquered except where it shows within the chapter ring and chime/silent ring. These portions are grained with emerypaper. The graining should

of the fret and one in a midway position at the bottom of the fret.

The lettering of the inscription is cut out of thin sheet steel, say about 1/64 in. thick. A fine tooth piercing saw is required for this operation. The pattern of the letters was taken from a magazine, the letters being cut out and stuck to the steel plate with Bostic clear cement. No other form of adhesive seems so suitable. After fretting out the letters, they are touched up here and there with a fine needle file and their face surfaces made smooth and bright on an emery stick. Afterwards they are blued over a bunsen burner. They are then cemented to the fret with Perspex cement (merely Perspex dissolved in chloroform). Finally the

easier to make the size of the plates to suit the layout of the wheelwork rather than *vice versa*.

A correspondent has queried the circular slots on either side of the dial plate, saying that the arc of the slots should be struck from the centre motion of the change chime and change tune levers. This is correct in theory but again for aesthetic reasons the arcs are struck from the centre of the dial so that the boundaries of the arcs are in line with the outer circumference of the chapter ring. It will be found that the pins on the free ends of the levers will not bind in the circular slots, for the slots are made a little wider than the diameter of the pins to allow a slight lateral movement of the pins in the



The design of the fret and (right) the fret in position on the dial face



be kept quite vertical and afterwards silvered, which will contrast well with the circular graining on the rings. The spandrels are better purchased, but can be cast if one has facilities for doing this. The spandrels may be obtained from Rowley, Parkes and Rowley, Brisset Street, Clerkenwell Road, EC2. They are attached to the dial plate with a screw inserted from the back of the dial plate.

The fret to the centre of the dial is rather an optional feature. It does, certainly, furnish it well. On the other hand, the hands of the clock show up clearer without it. The fret is cut out of 1/32 in. brass plate with the fret saw, and all edges carefully fine finished with file and emerypaper. The front surface is then polished. The fret can be attached to the dial plate with, say, three 10 BA screws, but I attached mine with three short thin lugs that passed beneath the inner circumference of the chapter ring. These lugs are shown in the drawing shaded, two being at the top

front fret is given a coat of lacquer.

The following are suggested modifications to the instructions which have appeared: 27 Sept., 1956, page 436, Fig. 1, item 4. Length  $\frac{3}{4}$  in. should read  $\frac{9}{16}$  in. but the longer dimension would do equally well. 11 Oct., 1956, page 517. Another drawing is given here of the barrel arbor with clearer dimensions. 14 Feb., 1957, page 253, Fig. 39. The winding holes of the chimes/strike train and the musical train are shown in line with the centre hole of the dial whereas they should be a little below the centre hole. From an aesthetic point of view the position as shown in the drawing is the most desirable, and a little modification of the layout of the train wheels would allow this to be done.

At the time the clock was made it was impossible to purchase brass material for private use, so the layout of the movement had to be designed to suit the amount I had available. It will be seen, therefore, that it is

slots. 29 Jan., 1959, page 135, Fig. 13. Height of the dial door should be  $16\frac{1}{2}$  in. and not  $16\frac{3}{4}$  in. Page 136, Fig. 15. The measurement of  $16\frac{1}{2}$  in. extends to the base of the hood. ■

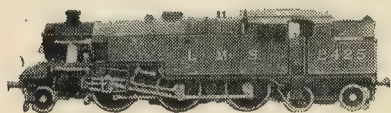
● Synopsis of articles on page 278

#### CLOCK REPAIRING AND ADJUSTING by W. L. Randell

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MODEL ENGINEER

# JUBILEE



The  $3\frac{1}{2}$  in. gauge LMS 2-6-4 tank locomotive by MARTIN EVANS

As some locomotive builders have a preference for the screw type of reversing gear, this week I shall describe one which is very robust and not at all difficult to make.

The screw itself is a  $\frac{3}{16}$  in. left-hand Whitworth, but a right-hand thread could be used. The only snag of the latter is the tendency for the driver used to the normal arrangement to turn the screw in the wrong direction. The reach rod is not quite the same shape as that required for the lever reverse as the rear end needs to come a good deal higher up to make operation convenient.

The stand is cut from  $\frac{1}{2}$  in. thick bright mild steel and as with the lever reverse, it can be bolted direct to the left-hand mainframe of the locomotive. However, before cutting this out it is necessary to determine the exact movement required. To do this put the reversing arm in the full forward gear position, that is to say, in such a position that the valve gives a full port opening front and rear. Make a mark on the top edge

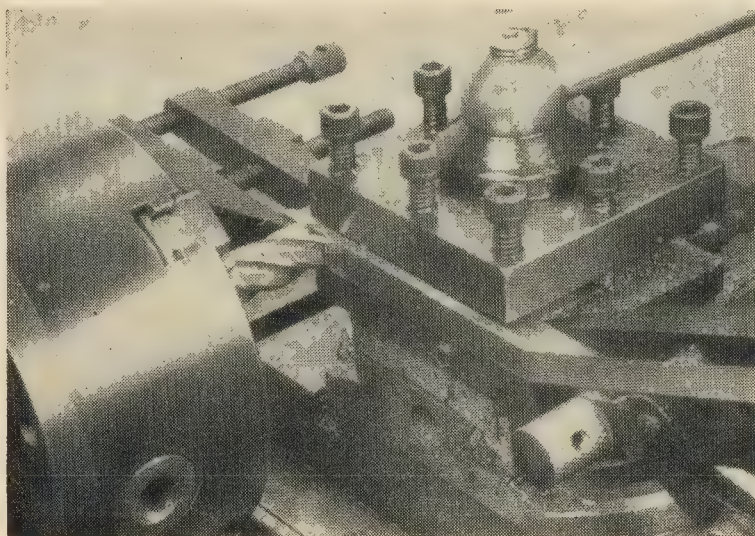
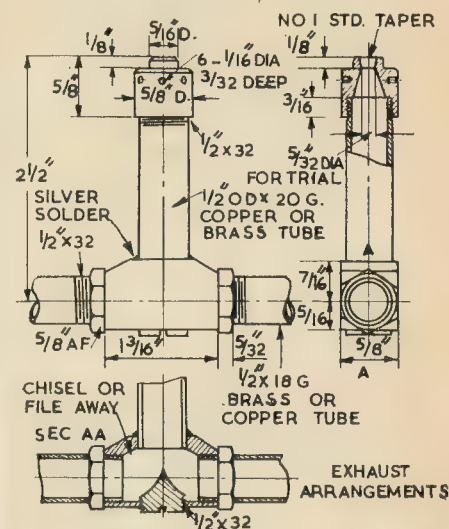
of the frame exactly opposite the pin-hole in the arm. Put the arm in the full backward gear position and make another mark.

The distance between the marks plus  $\frac{1}{2}$  in. for the length of the nut gives the length of the opening in the stand, although it is advisable to add 10 thou to the total, for safety's sake. The dimension will probably come out at  $1\frac{1}{2}$  in. or slightly less.

To fix the stand, all the five holes mentioned in my previous article can be used, in this case 5 BA hexagon-head screws being put in from the inside, into tapped holes in the stand. The next items are the two housings which support the bearings for the screw. These are cut from  $\frac{3}{8}$  in.  $\times$   $\frac{1}{4}$  in. bright mild steel. As it is important that the two bearings should be in line with one another, I think that the safest way to make these is first to clean the two pieces up to a length of  $\frac{9}{16}$  in., and mill the  $\frac{1}{8}$  in. slot with an endmill, the two housings being clamped in the machine vice mounted on the vertical slide in the usual way. After milling the slots, clamp the housings end-to-end using

a strip of  $\frac{1}{8}$  in. thick material placed in the slots to ensure them being in line. Then mark out the position for the bearings and drill right through the two with a  $5/32$  in. dia. drill.

The bearing housings are then brazed to the stand. So mount them in position putting a length of  $5/32$  in. dia. silver steel rod through the two to ensure their being in line, and tie together with iron wire. Apply flux to the required positions, heat



Milling the latch for the lever reversing gear

up to bright red and use brass wire. When the joints are made, allow to cool to black and quench in clean cold water.

Clamp in the machine vice by the stand, and again line up the two housings under the drilling machine by means of a  $5/32$  in. dia. rod. The rear housing should be uppermost. Put a  $\frac{3}{16}$  in. dia. drill through both housings, followed by a  $\frac{1}{4}$  in. drill through the rear housing only.

The next items are the two bronze bushes, which are straightforward turning jobs. The front bush is turned a press fit for the  $\frac{1}{16}$  in. hole in the front housing and is made  $\frac{9}{16}$  in. long. It is pressed in from the outside and should protrude  $\frac{1}{16}$  in. on the inside.

The rear bush is turned down to a press fit for the  $\frac{1}{4}$  in. dia. hole, leaving a head of  $\frac{1}{8}$  in. length and about  $\frac{5}{16}$  in. dia. This bush should be flush on the inside. Incidentally, it would be advisable to jam an odd piece of metal between the two housings when pressing home the bushes in the vice, just in case the former should be distorted.

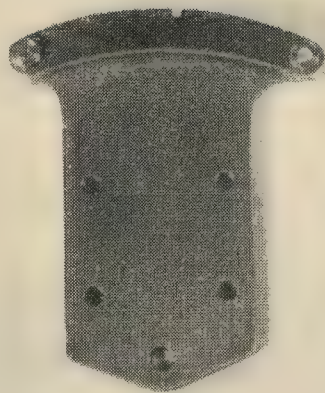
The nut is made from  $\frac{1}{2}$  in. square phosphor-bronze or gunmetal, but as this size may be difficult to obtain, it could be cut down from a short length of larger round or hexagon material using the four-jaw chuck. Note that the internal thread is offset by  $\frac{1}{16}$  in. It will be found easier to mill out the  $\frac{1}{8}$  in. wide slot in the bar, before cutting to length.

After drilling and tapping as required, a No 31 hole is drilled centrally in the top of the nut and a No 23 on the left-hand face. The former is for a guide pin, made from  $\frac{1}{8}$  in. dia. silver steel, filed to  $\frac{1}{16}$  in. on the part which protrudes above the nut. The pin which carries the reach rod is made from  $5/32$  in. dia. silver steel, the outer end being turned down and threaded 6 BA, the inner end being pressed into the No 23 hole in the nut.

Coming now to the screw, this is machined from  $\frac{1}{2}$  in. dia. bright mild steel. Chuck a piece about  $3\frac{1}{2}$  in. long, support the end in the tailstock and turn down to  $\frac{3}{16}$  in. dia. for a length of  $2\frac{1}{16}$  in. Rechunk on the  $\frac{3}{16}$  in. dia. with about  $\frac{3}{8}$  in. protruding from the chuck jaws and turn the  $\frac{1}{8}$  in. dia., a nice fit for the front bearing. Then turn the last  $\frac{1}{2}$  in. to 0.110 in. dia., and thread 6 BA.

Chuck on the  $\frac{1}{2}$  in. dia. once again and thread  $\frac{3}{16}$  in. Whit left-hand or whatever thread is preferred, to suit the nut already made. Finally, reverse in the chuck and hold by the unthreaded part of the  $\frac{3}{16}$  in. dia. to turn the other end. The square can be filed while still in the lathe.

The top-plate, which by means of its slot gives further support to the nut, is cut from  $\frac{1}{16}$  in. thick bright mild steel. Drill the two holes first. These can then be used to bolt the plate to another piece of steel about  $\frac{3}{8}$  in. square. This is then clamped in the machine vice on the vertical slide and brought up to a  $\frac{1}{16}$  in. slot-drill held in the three-jaw or collet. Alter-

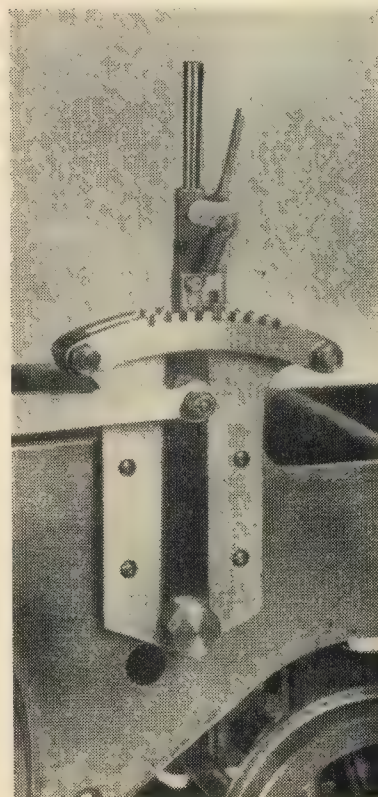


Parts of the lever reverse

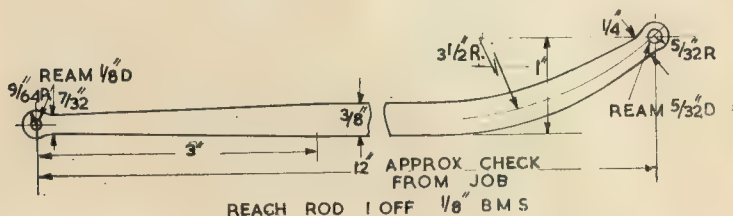
natively a  $\frac{1}{16}$  in. thick slotting cutter or a Woodruffe cutter could be used. In this case the  $\frac{3}{8}$  in. square bar should be made long enough to enable it to be clamped at each end to an angle bolted to the vertical slide, the set-up being similar to that used for fluting valve gear rods, etc.

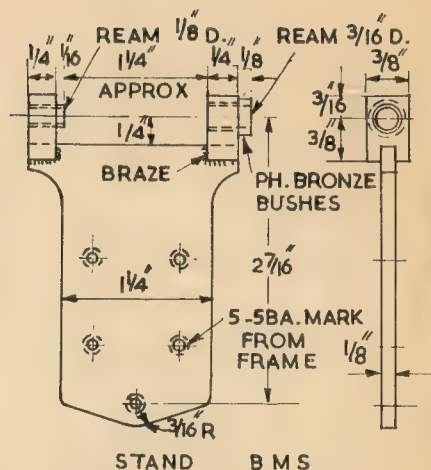
The length of slot required should be checked from the movement of the nut on the screw. This slot could also be cut by hand, drilling a row of holes about No 55 and cutting through with a metal fretsaw and finishing with a fine needle file. Grooves may then be scribed in to show full and mid-gear positions and intermediate positions of cut-off as preferred. The top plate is held down to the stand by two 8 BA roundhead or hexagon-head screws into tapped holes in the two bearing housings.

The final item for the screw reversing gear is the handle, which is made from  $\frac{1}{2}$  in.  $\times$   $\frac{1}{8}$  in. bright mild steel with  $\frac{1}{8}$  in. dia. for the hand-grips. The square can be cut by first drilling

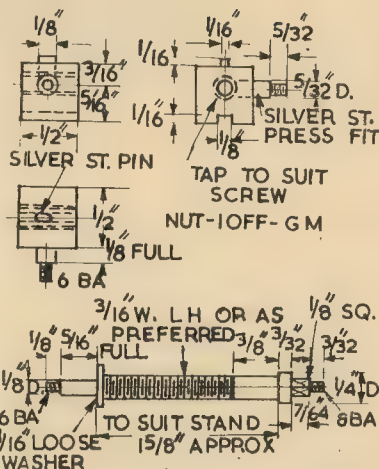


Reversing gear after mounting

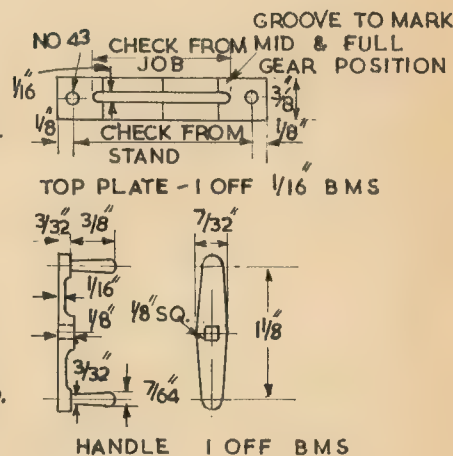




Making a start on the exhaust, the T-piece is made from a length of  $\frac{3}{8}$  in. square brass, though it is possible that one of our enterprising advertisers will supply a casting for this and for the steam tee. The drilling and tapping for the cylinder connections are best

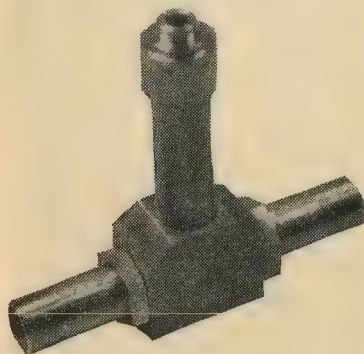


The locknuts are made from  $\frac{5}{8}$  in. A/F brass hexagon while the blast nozzle, which is removable, is turned from  $\frac{5}{8}$  in. dia. brass rod. It is worth while achieving the correct orifice shape and I suggest that  $5/32$  in. dia. should be about right for the minimum internal diameter, this being tapered on the outlet side by a No 1



Assembly is as follows. Anoint the threads of the connecting pipes and run on the locknuts, screw the two pipes as far into the tee as they will go, insert between the cylinders and unscrew the pipes into their respective cylinders until just under 3/32 in. length of thread is still inside the tee. Then clamp up, checking, of course, that the blast pipe is quite central and vertical. The nozzle should not be screwed up tight at this stage as it will have to come off again when the smokebox is fitted.

★ *To be continued on March 12*



*Exhaust and blast pipes ready for assembly on the locomotive*

# A 6 in. circular saw bench

By N. Kettle

## How to construct the hinges, tilt mechanism, control wheel and other sections of this labour-saving device

Continued from February 12th, page 195

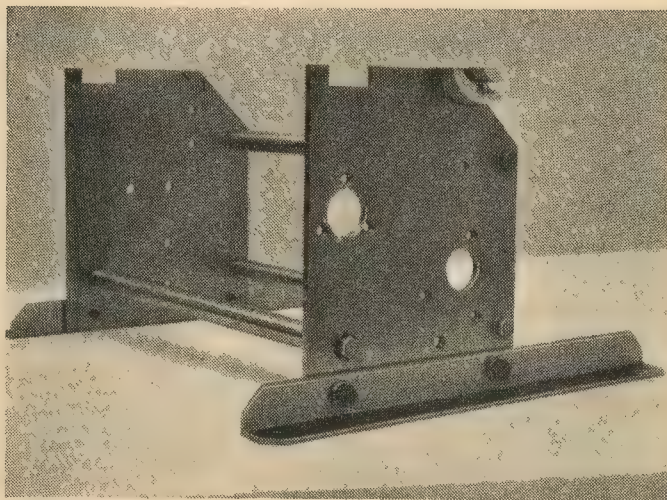
THE next job to be undertaken was the hinges, and as will be seen from the drawings, they have been so designed that the centre of the hinge is on the top surface of the table. This is necessary to ensure that there is no lateral shift in the table slot when the table is tilted throughout its range.

Two pieces of aluminium were cut off a bar length, centred, drilled and reamed to  $\frac{3}{8}$  in. in the lathe. Each was then mounted in turn on an expanding mandrel held in a collet chuck and turned to the dimensions shown in the drawings. These two pieces now have interlocking faces, and when mated both turn on the same axis.

At this stage the  $\frac{3}{8}$  in. reamer was passed through the central hole of the mated pieces as a check that all was well.

The mated sections then had to be sawn in two. This was done by drilling a series of  $\frac{3}{16}$  in. holes across the diameter and finishing off with a hacksaw. The sawn face was then milled to exactly  $\frac{3}{16}$  in. (the thickness of the table plate) below the centre. As the central hole was  $\frac{3}{8}$  in. this formed an easy guide, as the radius of the hole was the required  $\frac{3}{16}$  in. All that remained, therefore, was to mill the sawn face of each mated section until the bore just disappeared.

Each section was suitably marked to avoid crossing the components, which were then separated so that the requisite segments could be milled to 135 deg. This was done by holding each segment in the machine vice on the milling slide so that the milled edge was square with the lathe axis. The milling slide was then set over to 45 deg. and the surplus metal milled



Assembled body frame separated by three  $\frac{3}{8}$  in. dia. spacers

away. The resulting faces were exactly the same length and at 135 deg. to one another.

These 135 deg. segments comprise the parts of the hinge which are fitted to the front and rear body plates. The 180 deg. segments were next fastened to the inside of the table supports, great care being taken to ensure that they were positioned absolutely centrally in relation to the 6 in. wide inside central plate.

It was decided at this stage to leave the rest of the table and to concentrate on the construction of the body framework. The body consists, essentially, of a front and rear plate in  $\frac{3}{16}$  in. b.m.s. separated by, and screwed to, three  $\frac{3}{8}$  in. dia. spacers.

An examination of the drawings will show that the profile of each plate

is the same and the three holes for the spacers and two for the feet are also common to both plates.

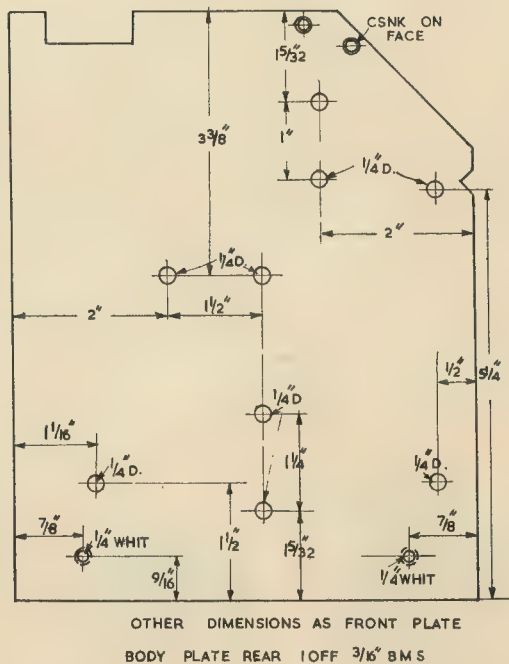
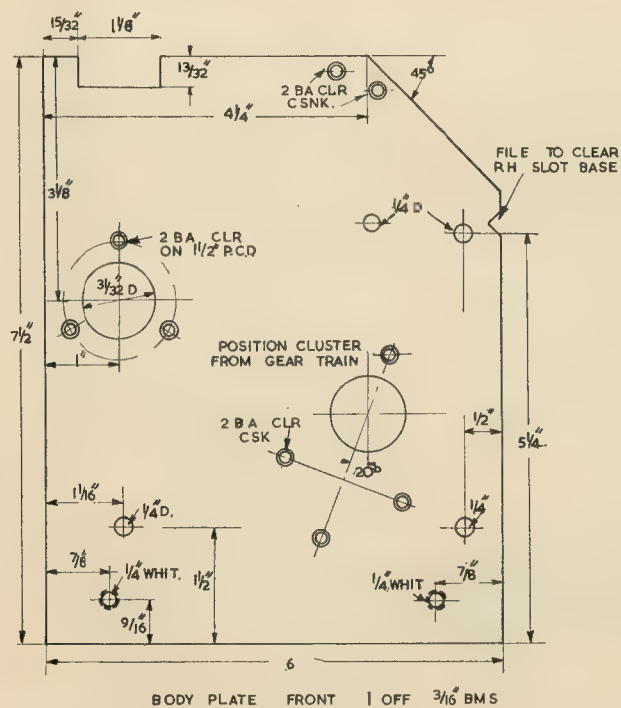
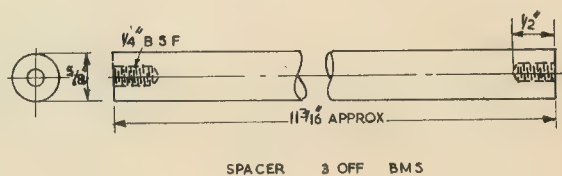
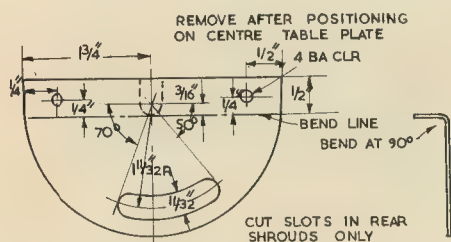
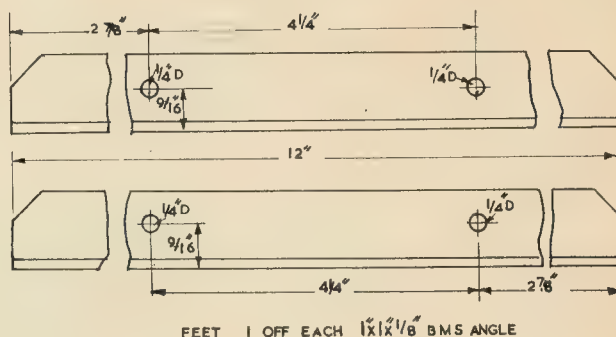
One plate was accurately marked out and clamped to the second roughed-out one and the five holes already mentioned drilled through both plates. Using the spacer holes they were then bolted together and sawn and filed to shape.

After separating, the hole for the tilt mechanism control was drilled and bored to 29/32 in. with the front plate mounted on the milling slide and using a boring bar between centres. The holes for the tilt pointer, rise and fall gear train assembly, and guard were not drilled at this stage. The exact location of the latter are determined from the gear train plate to be constructed and positioned at a later date.

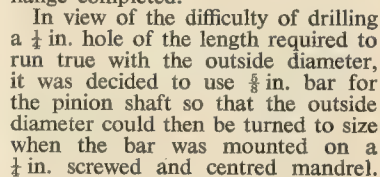
In the rear plate the various  $\frac{1}{4}$  in. holes were drilled and the hinges screwed into position on the outside face of each plate. With the table flat on the bench the hinge halves were mated and the distance between the inside faces of the body plates measured to give the exact length of the spacers.

These were cut to length from  $\frac{3}{8}$  in. bar using the fixed steady. The holes





The pivot housing which attaches the rack to the table was milled from a piece of aluminium. The holes to take the silver steel pivot were drilled and reamed to  $\frac{1}{4}$  in. and, with the rack in position, the pivot threaded through and locked with the Allen screw as detailed in the drawings. The housing was screwed into position



Technical drawing of a 1 OFF SILVER STEEL part. The drawing includes three views: a front view, a top view, and a side view. The front view shows a rectangular part with a central circular hole. Dimensions include a total width of 1 1/2, a hole diameter of 1/4, and a hole offset of 1/4 from the left edge. The top view shows a rectangular part with a central circular hole. Dimensions include a total width of 1 1/2, a hole diameter of 1/4, and a hole offset of 1/4 from the left edge. The side view shows a rectangular part with a central circular hole. Dimensions include a total width of 1 1/2, a hole diameter of 1/4, and a hole offset of 1/4 from the left edge. The drawing is labeled "1 OFF SILVER STEEL" and "4 BA CLR" and "6 BA TAP".

# Locos for difficult terrain

By R. C. YULE

When the going gets rough, the articulated locomotive comes into its own

SEVERAL types of locomotive powered by one engine have been developed for use on railways of inferior formation and road bed, such as are required for logging, mining and tourist traffic in out of the way areas.

In the USA a group of locomotives were evolved which used four-wheel trucks driven by one engine, mounted on the main frame, through a transmission shaft and gearing. Simple locomotives had a truck at each end of the main frame; if more power was needed, the tender was enlarged and a further truck or trucks placed under it. These locomotives were flexible and powerful, having comparable performance to Malletts of the same weight on the level and a much better performance uphill. They could negotiate curves of 150 ft radius and haul useful loads up gradients as severe as 10 per cent; because of the even torque applied to the driving wheels through a reduction in the

gearing of the drive the rails were not subjected to hammer action. Consequently these locomotives could be employed on comparatively rough-and-ready lines in difficult country.

Examples of locomotives of this group were the Shay, the Climax, the Baldwin and the Heisler. The power unit of the Shay locomotive was a three-cylinder vertical engine mounted on the offside of the locomotive and the centre line of the boiler was offset to the left of the locomotive's centre line to allow this position to be used. The crankshaft was horizontal and located at the wheel centre level and outside them.

## Transmission system

On each off-wheel of each bogie a bevel pinion was fixed and this was driven by a pinion on the horizontal transmission shaft, a reduction of 2:1 or 3:1 being usual. To allow for the independent movement of the bogies, the transmission shafts had

two universal joints and a sliding joint of square section between the bogies and the crankshaft. If a third or fourth bogie was used, the transmission shaft continued on from the rear truck, with the same kind of jointing arrangements. Each wheel therefore received 12 or 18 impulses per revolution, and the locomotives could haul loads up steep gradients at about 4 m.p.h.

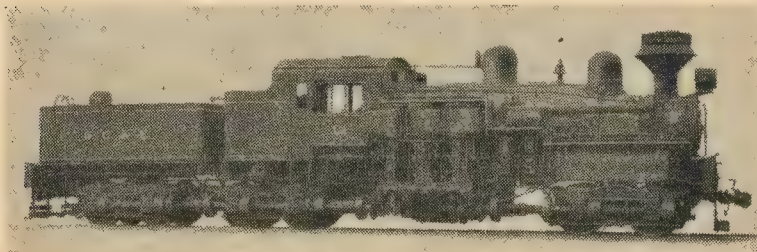
In the Climax locomotive, the crankshaft was located beneath the boiler on the locomotive's centre line, so no off-setting of the boiler was needed. There were two types. In the smaller a high speed vertical twin-cylinder engine was mounted in the back of the cab. In the larger, the two cylinders were placed either side of the smokebox as is fashionable with normal locomotives, but sharply inclined to allow them to drive a transverse crankshaft under the middle of the boiler.

In both types reduction gearing was fitted between the crankshaft and transmission shaft, and the transmission shaft had universal joints and sliding joints. Bevel pinions on the transmission shaft engaged with similar pinions on each axle, these pinions being fixed alternately to the left and right of the transmission shaft.

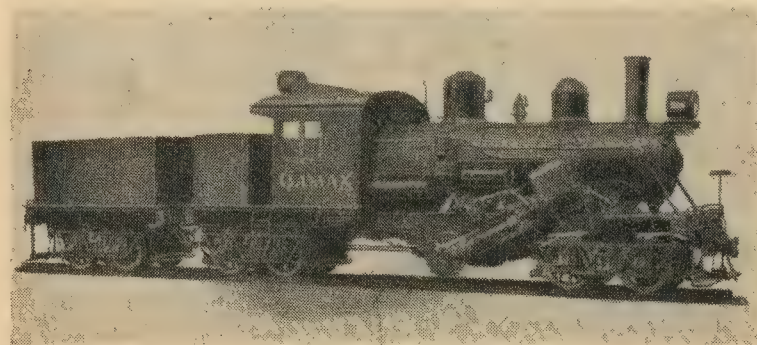
The Baldwin type resembled the larger Climax in that its cylinders were placed on each side of the smokebox and drove a transverse crankshaft to which a central transmission shaft was geared. The cylinders, however, were horizontal, and the transmission shaft drove direct only the inner axle of each bogie where the reduction of  $2\frac{1}{2}:1$  occurred. The outer axle was driven by a subsidiary transmission shaft from this inner axle. If, therefore, another bogie was wanted the drive for it entailed a further main transmission shaft under the firebox. Unlike the two preceding types, the reduction gearing ran in an oil bath.

The Heisler locomotive also made use of a central transmission shaft to drive one axle by bevel gearing in an oil bath. The cylinders, however, were placed immediately in front of the firebox and drove a single crank on the transmission shaft, an arrangement we now call a V-drive.

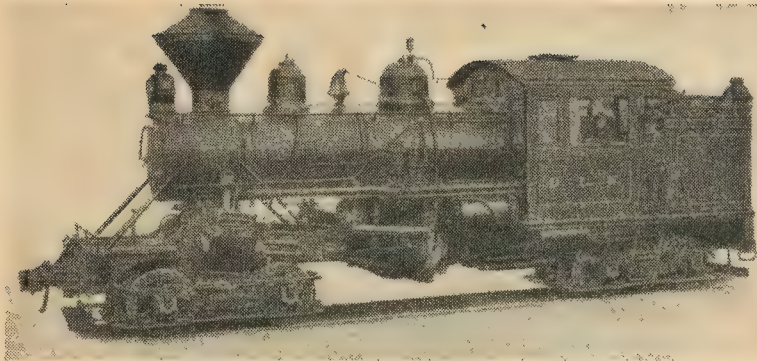
This transmission shaft was high



*A Shay geared 4-4-4 locomotive of the Greenbrier, Cheat and Elk Railroad. Of standard gauge, it was built by Lima Locomotive Works*



*Climax geared 4-4-4 locomotive*



*Baldwin geared 4-4 locomotive*

enough to clear the inner axle of the bogie and was then inclined by a universal joint to a 2 : 1 bevel reduction gear on the leading axle. The axles of each bogie were connected by coupling rods in the usual way.

The last three types do not appear to have been used outside the USA, where their use was confined to branch lines. The Heisler was used extensively on the Northern Pacific Railway.

The Shay was used all over the American continent and some examples were used in China, Formosa and Australia. Types were built for a variety of gauges as well as for the standard gauge.

In Europe, little attempt was made to use gearing to drive bogies, because early efforts to do so failed from mechanical weakness. So designers concentrated on trying to transmit the drive by rods, without notable success: if two bogies were required each was provided with its own motive power and the Garratts, Fairlies and Golwé groups evolved.

Out of the two dozen or so single-engined designs, two developments

are interesting and ingenious, as they compared in power with Mallets of similar weight and gauge but could negotiate much sharper curves. One system was designed by Orenstein and Koppel; the other by Klien and Lindner.

In both these systems, the locomotive resembled the ordinary Continental locomotive in outline, valve arrangements, cylinder position and so on. Articulation was achieved by ingenious arrangements to allow the outer axles to move and take up any oblique position relative to the main frame dictated by the actual curve of the rails over which the locomotive was passing.

In the Orenstein and Koppel system, in which the locomotives were all 0-10-0 types, this was done by gearing the outermost axles to the next innermost axle in order to transmit the drive. The three centre axles were all fixed to outside frames in the normal way and driven by connecting rods and coupling rods as usual. Fixed to the centres of the outer of these three axles was a

pinion which could swivel over a spherical bearing on the axle, and to which the drive could be transmitted through a ratchet clutch.

On the outermost axles of all a pinion was fixed rigidly. An idler pinion between the swivelling pinion on one axle and the fixed one on the other transmitted the drive between the two axles. From the outermost axles, therefore, a rigid train of gears, which incidentally ran in oil and were completely enclosed in a casing, went to the inner axles about which they could pivot and still be driven whatever curve the locomotive happened to be traversing. Elaborate devices were incorporated to reduce shock caused by the rails.

These locomotives were extensively used in Germany—especially on the 2 ft gauge military lines—and examples were in use in Java, Japan and Brazil. Those built for the 2 ft 6 in. gauge could negotiate curves of 98 ft radius.

#### Sleeve axles

Unlike the other types mentioned here, the Klien-Lindner system did not make use of gearing. The outer wheels were fixed to a sleeve which enclosed the axle proper. In the centre of the axle was a spherical ball enclosed by a short sleeve which could pivot about the ball. This sleeve, in turn, was enclosed by another on which the wheels were fixed, and the outer sleeve could slide upon the inner one. Thus, although the axle was fixed normally to outside frames, and fitted with cranks for the drive to be taken by coupling rods from cranks on the inner fixed axles, the wheels could turn and slide about the axles to take up any position the rails dictated.

The drive between the axle and the sleeve was simply effected by a stout pin pressed through the spherical ball and gripped in a transverse slot in the outer sleeve. To prevent hunting on the straight, a system of rods ending in straps encompassing the sleeves near the wheel connected the outer wheels to each other through pivots on the frame.

These locomotives were used extensively on narrow gauge routes in Central Europe. Those designed for the 2 ft 6 in. gauge could negotiate curves of only 50 ft radius perfectly.

Comparison between locomotives designed to meet different conditions of service is difficult, but these locomotives were not freaks compared with more popular articulated locomotives of about the same gauge. □



*Heisler 4-4 locomotive showing trussed I-beam frame construction*

\* Pictures reproduced by courtesy of Messrs Constable and Co. Ltd, from *Articulated Locomotives* by Lionel Wiener.

# Experimental boiler in $\frac{3}{4}$ in. scale

By Arthur Hughes, of Massachusetts, USA

**T**HIS boiler has a complete water-tube firebox that can easily be removed from the barrel for inspection. All tubes have been rolled in their tube sheets the regular way by a tube expander made for the work.

The firetube section contains 66 tubes and the firebox 88, making the generating heating surface 6.5 sq. ft. The superheating surface is 45 sq. in. There are three superheaters, one on each side of the firebox and two rows of tubes from the fire. The third is at the top of the firebox exposed to the radiant heat.

The side wall superheaters are made of copper. No 3 is made of No 304 type stainless steel tube 0.035 in. thick. The outlet is piped to the cylinders through a  $\frac{1}{2}$  in. dia. 304 type tube thin wall, with an annular gas space around the tube equal to the area of one generating tube. The steam and water drums are made of solid mild steel bar machined to size. Tubes in the water drums were difficult to roll in, due to the inside diameter being less than 1 in.

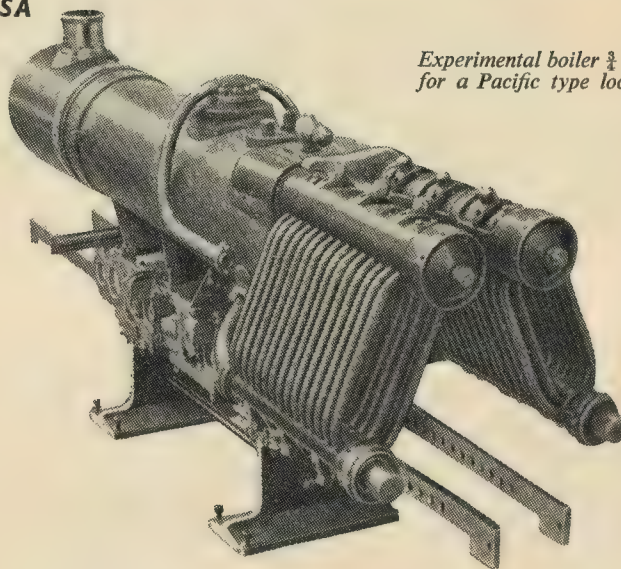
The barrel was turned from a mild steel tube with a  $\frac{1}{2}$  in. wall. This tube was turned to a shell thickness of  $\frac{5}{32}$  in. in order to make the conical or wagon top as it is sometimes known. The major diameter of this

section of the boiler is  $4\frac{3}{8}$  in.

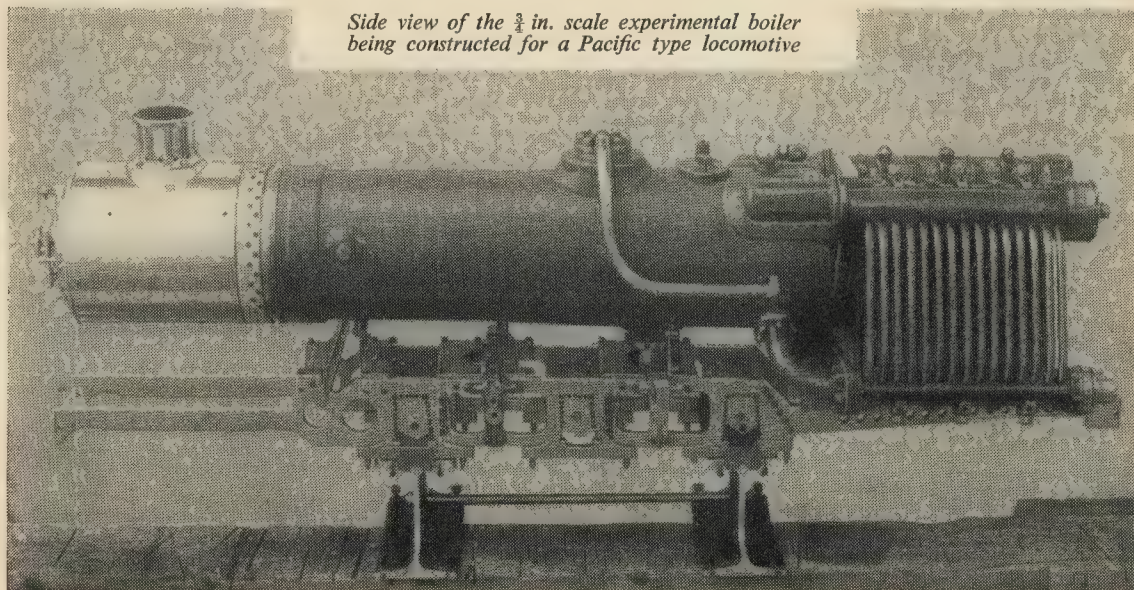
The boiler has been hydrostatically tested to 350 p.s.i. and found tight. Superheaters are not yet complete and will be tested later when the main steam piping is finished. No stays, braces, or gussets are necessary in its construction. I expect to carry 150 p.s.i. working steam and if wheel slip develops cut it down to suit the weight.

Engine frames are stainless steel and a tough job to work. Patterns for the cylinders are nearly complete. I expect to have them in manganese bronze with cast iron liners also in the piston valve chambers. The patterns for the driving wheels were made from an English wheel that I purchased some years ago. They have 22 spokes and turned out to be an excellent job. ■

*Experimental boiler  $\frac{3}{4}$  in. scale for a Pacific type locomotive*



*Side view of the  $\frac{3}{4}$  in. scale experimental boiler being constructed for a Pacific type locomotive*



# TICH TOPICS

By LBSC

Testing the modified version of the popular beginner's locomotive was fun. Connecting and coupling rods, eccentric rods and links vanished in a blur. For a small engine her speed and power were amazing

I HAPPEN to be one of those old-fashioned folk who are firm believers in the adage that experience is the best teacher. It is now over 65 years since I built my first working steam locomotive. What my total output of new engines and rebuilds amounts to at the time of writing, I haven't the least idea. My earlier efforts have long since gone to the scrap heap. Some of my later ones are scattered all over the world. At the present moment there are 17 in my running-shed, all in good working order, and others are being built.

I also believe that one is never too old to learn. Every locomotive I have built or rebuilt has taught me some kind of lesson. Unless it does, there seems to be something missing. Many of the lessons that I have learned have been incorporated in the instructions given in these notes. I have had many a chuckle when someone has "laid down the law" by virtue of having built one or maybe two locomotives.

When I started giving the drawings and instructions for building the original *Tich*, I built a chassis comprising frames, wheels, feed pump

and cylinders to enable me to visualise the rest of the engine and make sure that everything fitted as it should. When the series was completed, the chassis was laid aside and nearly forgotten.

About a year ago, after completing a larger engine, I thought I would finish *Tich* with a few variations, and in the issue dated February 20 1958 I gave a drawing of the modified version. This showed a boiler with a Belpaire firebox, outside link motion, and other items differing from the original design. The engine was finished some time ago, rather later than I intended, and I have learned a lot from that job.

The boiler was made to the dimensions given in the issue referred to, but not the smokebox. While searching out the oddments for the boiler I found a piece of 3 in. brass tube just the right length for the smokebox, and decided to use it. Being rather partial to stovepipe chimneys and having a spare of the same dimensions as specified for my 2½ in. gauge *Southern Maid*, which also has a 3 in. smokebox, I used that also. This made the engine look like one of the low-built shunters working around dock lines where clearances are limited. The smokebox was joined to the 2½ in. barrel by a turned ring

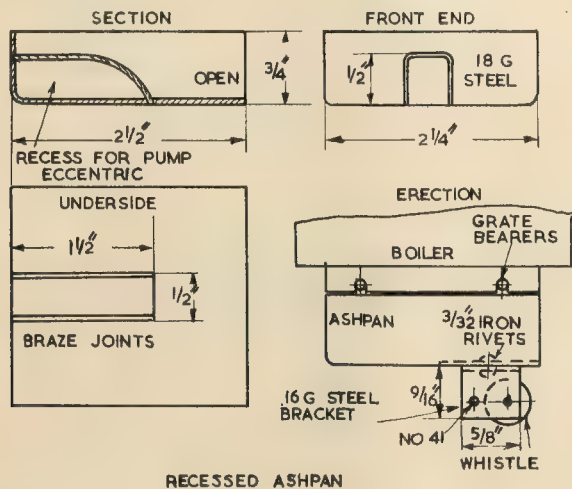
and looks very well, the ring being radiused and polished where it shows.

On trying the boiler on the chassis I found that the firebox came well back over the driving axle owing to the barrel being ½ in. longer than the original design. So I made another variation, this time in the ashpan. As I like the ashpan to be fairly deep I made one the usual horizontal type ¾ in. deep. To allow the pump eccentric room to work, a slot ½ in. wide and 1½ in. long was cut in the front part, and a channel-shaped gadget was cut out and fitted in the slot as shown in the drawings. This was brazed in, and allows the pump eccentric ample clearance. Also there is no obstruction to the firebars.

The ashpan is a fixture as it is easy on this little engine to tip out any residue through the firehole after a run. A supporting bracket was made from a strip of 16-gauge steel ½ in. wide, bent channel-shape to fit between frames and riveted to the bottom of the ashpan. The grate bearers project beyond the end bars and fit into nicks filed in the lower edges of the firebox side sheets. The ashpan thus supports the grate when in position, and is in turn held in place by screws put through clearing holes in the side frames into tapped holes in the side members of the bracket. Two of the screws also support the whistle.

I mentioned last week that the most desirable place for a whistle was under the ashpan where it would keep hot, avoiding the gurgling caused by steam condensing when entering a cold whistle. On this job the whistle is located between the sides of the bracket, and so far has always blown a clear note. The barrel is a piece of ½ in. thin brass tube faced off at both ends to fit in the bracket. One end is plugged by a brass disc turned to a press fit and tapped to take a 3/32 in. screw.

An organ-pipe slot was filed at ½ in. from the other end, to within ⅛ in. of the centre line of the tube. This was 9/32 in. long at first, but as the whistle made an unearthly blast at 80 lb. pressure, I lengthened it to 11/32 in. full, and now it is audible at the other end of the street,



the note being quite clear. As there is only one slot, the deflector disc was turned to a press fit and the diameter reduced by a full  $1/64$  in. to suit the width of the slot. This was done by working the lathe mandrel back and forth and feeding a square-nosed tool into the disc. The plug at the slotted end is  $9/32$  in. long and tapped  $3/32$  in. and a  $7/32$  in.  $\times$  40 union nipple is screwed into the side of it as shown. With the whistle in position, the two rear bracket screws engage in the tapped holes in the plugs and support it. The union nipple is connected to the one on the turret by a  $1/8$  in. pipe.

I've had some fun testing this engine. Her one ambition in life is to go—and I mean just that. The fact that the wheels are only equal to 2 ft 8 in. dia. in full size, makes not the slightest difference. Connecting and coupling rods, eccentric rods and links, simply disappear in a blur. I thought that my old *Caterpillar* could turn her "coat-button" wheels at a tidy rate, but this one takes the biscuit. It is a wonder how the boiler supplies the steam, but the valve gear makes the best use of every bit, and she has a very free exhaust.

The first thing that happened was a scream. I coupled up the pipes one evening and tried her on air. There was a blow at the snifting valve which projects through the smokebox, so I took it off and found a chip of metal in it. Just as I was about to

replace it, there was a telephone call and operations ceased.

The next afternoon being fine, I decided to snatch the opportunity for a trial run and got up steam, completely forgetting that I hadn't replaced the snifting valve. On opening the regulator there was a rush of steam from the open pipe under the smokebox—but did she worry? Not on your life—she just ambled off hauling the flat car and did half a lap of the line enveloped in steam. There was still 25 lb. showing on the gauge when I went across and stopped her. Had the line been ballasted, the permanent way gang would have had a peach of a job!

#### Phenomenal power

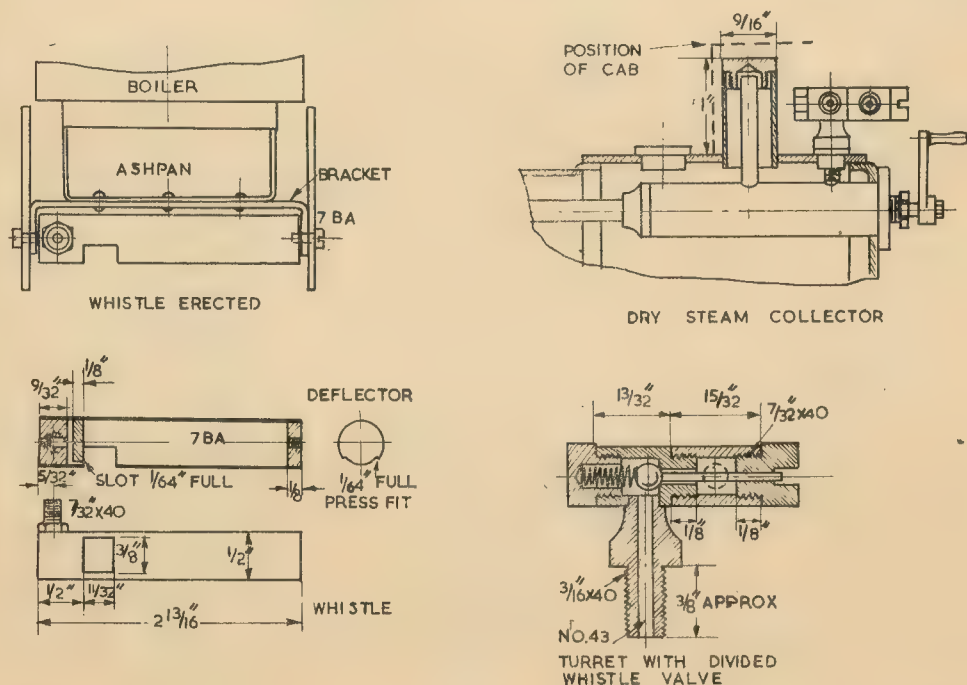
With the snifting valve replaced, she soon showed that she had an amazing amount of speed and power for such a small engine. The exhaust was at first invisible, but suddenly it began to show as a white cloud from the chimney. As she still kept going and maintained pressure, I thought that what enginemen call a "bird's nest" had formed on the return bend of the superheater, blocking the flue and causing the engine to run on wet steam.

Anyway, I let her run the fire down and then had another surprise. There was no "bird's nest." As there were yet no hinges on the smokebox door, I had attached it temporarily with a dummy crossbar and a  $1/8$  in. screw.

The heat had expanded the crossbar and allowed the door to slip, leaving a gap like a new moon showing at the top of the door. Air had entered this, condensing the exhaust and partly destroying the smokebox vacuum—but still she kept going.

When the Great Eastern three-cylinder Decapod 0-10-0 tank engine did her acceleration tests at Chadwell Heath at the turn of the century, she primed badly when getting away, so did my *Tich*. I had fitted a disc regulator which took steam from the top of the Belpaire firebox, after Swindon practice, but with some small holes drilled in the top of the regulator barrel instead of the Swindon pipes. At her maximum rate of acceleration the water just bunched up at the back of the boiler, surging right to the top of the firebox wrapper, filling the gauge glass over the top nut and going down the holes in the regulator barrel.

I didn't want to alter the whole arrangement and take steam from the dome on the boiler barrel, as I intended to try the Maunsell top feed arrangement in which the feed-water enters at the dome. It appeared that the easiest solution of the problem was to fit an auxiliary dome over the firebox and take steam from the top of it through an internal pipe to the regulator barrel. There was plenty of room for it between the turret and the cab front and the cab would hide it. This was done, and the



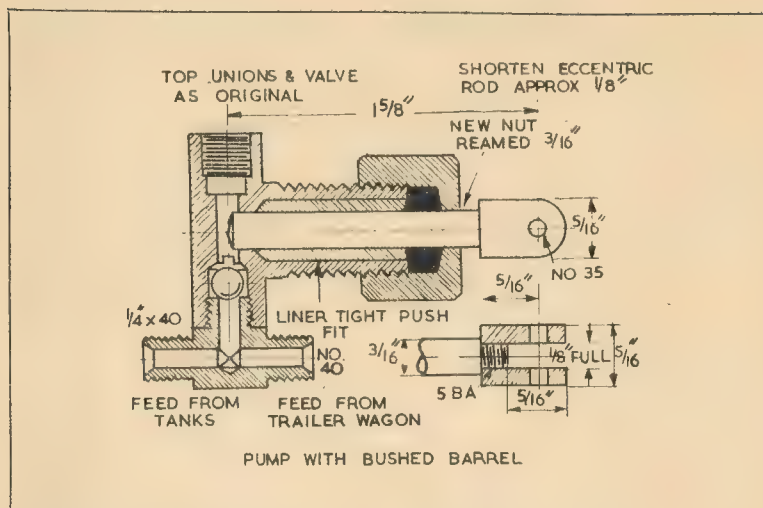
accompanying drawing shows the whole set-up.

The regulator was easily removed by taking out the screws in the flange and unscrewing the whole assembly from the steam pipe. At  $\frac{7}{8}$  in. ahead of the turret centre a  $\frac{9}{16}$  in.  $\times$  36 hole was drilled and tapped in the top of the firebox wrapper. A piece of  $\frac{9}{16}$  in.  $\times$  16-gauge copper tube  $1\frac{1}{8}$  in. long was screwed to fit the hole tightly for  $\frac{1}{8}$  in. length. A bush was silver soldered into the other end and tapped  $\frac{7}{16}$  in.  $\times$  32. A cap was turned to fit, the centre of this being recessed out with a  $\frac{5}{16}$  in. drill as shown in the section. The tube was screwed into the hole to the end of the thread. To seal it, a little liquid soldering flux was applied to the joint and a small blob of solder laid close to the tube. I put a No 50 tip in my Alda blowpipe and when the tiny but powerful oxy-acetylene flame was applied, it did the trick nicely. The intense local heat sweated the solder right through without even discolouring the surrounding metal.

#### Altering regulator barrel

The regulator barrel with the holes in it was replaced by a fresh tube and the regulator temporarily replaced. The centres of the new dome and the turret bush were then marked on it, the regulator taken out again, and  $\frac{3}{16}$  in.  $\times$  40 holes drilled and tapped at the marked spots. The regulator was then refitted permanently and a piece of  $\frac{3}{16}$  in. tube barely  $1\frac{1}{8}$  in. long was screwed into the barrel down the dome as shown. When the cap was screwed on, the pipe entered the recess in it and it would take a mighty big surge to enable water to reach the "entrance to the way out."

The proximity of the new dome to the turret bush naturally prevented the turret being replaced as it was, but that was no obstacle. The valve ball, spring and end caps were removed and the short end screwed on to an improvised stub mandrel held in the chuck. A full  $\frac{5}{16}$  in. of the longer end was parted off, and the remainder turned down for  $\frac{1}{8}$  in. length to  $7/32$  in. dia. and screwed  $7/32$  in.  $\times$  40. The ball, spring and cap were replaced, and the turret screwed home, the shortened end allowing sufficient clearance to pass the new dome. A tapped bush  $15/32$  in. long was made from brass rod and screwed on to the stub, the position of the union for the whistle pipe being marked on it. After removing the bush, drilling it from the union, fitting and silver soldering same, the whole lot was reassembled as shown. The stem of the turret goes down into the regulator barrel,



so that steam is taken from the top of the new dome and surging of the water is of no consequence.

On the next trial trip another spot of bother became apparent. When the little wheels are spinning like those of a racing car and the pump is feeding the boiler, the water squirts from the outlet of the side clack on the boiler barrel like the discharge from a fire hose. Anyway, it stirred up the contents of the boiler so violently that the spray went down the steam pipe in the new dome and there was still a certain amount of priming when the pump was feeding. Regulation of the bypass seemed to be of no avail. At the speed at which the pump was working it was impossible to regulate the flow accurately, and the commotion inside the boiler filled the water gauge with bubbles.

#### The cure

I had previously experienced this trouble with my  $2\frac{1}{8}$  in. gauge LNWR 4-4-0 *Sybil*, and I cured it by lining up the pump barrel and fitting a smaller ram. *Tich* had the pump which I specified originally with a  $\frac{5}{16}$  in. ram, so the ram was removed, also the eccentric rod and strap. I turned up a bronze liner to a tight push fit in the pump barrel, drilled and reamed it  $5/32$  in. and fitted it. A new rustless steel ram was made to fit the liner, and as this was too small in diameter to slot for the eye of the eccentric-rod, I fitted a fork on the end. A fresh gland nut was made with a hole in it the correct size for the new ram. I found that the eccentric rod needed shortening  $\frac{1}{8}$  in. to suit the new arrangement, as the fork projected beyond the gland nut.

The lined up pump now feeds much less violently and there is no

trouble with "stormy seas" inside the boiler. The gauge glass remains steady and no water goes down the steam pipe. The little ram puts in all the water required. I don't bother to regulate the bypass valve, but turn it on and off as required. The reproduced drawing shows the alteration, but please note that in it I have shown the pump ram  $\frac{3}{16}$  in. dia. instead of  $5/32$  in. and if any *Tich* builder alters the pump as described, or makes a fresh pump, I recommend the  $\frac{3}{16}$  in. ram. The reason is that my own locomotives are notorious for the small quantity of water they require, and others that I know of aren't quite so economical. The extra  $1/32$  in. ram diameter may be found advantageous.

I am now trying out a variation of the Maunsell top feed, using the side clacks with internal pipes and if this is successful I hope to refer to it in another article.

LBSC writes every week

### Working Drawings for Pansy

EIGHT sheets of working drawings for the 5 in. gauge *Pansy* are now available. Sheet 1: general arrangement, main frames and buffer beams, 4s. 6d. Sheet 2: wheels, axles, axleboxes, horns, frameways, coupling rods and cylinders, 3s. 6d. Sheet 3: cylinders and attachments, valve gear, eccentric straps and rods, connecting rods, reversing lever and bracket, 4s. 6d. Sheet 4: regulator, superheater, crosshead pump, lubricator drive assembly, arrangement of pump, steam and exhaust pipes, 4s. 6d. Sheet 5: superheater and details of smokebox and its assembly 4s. 6d. Sheet 6: boiler, water-gauge, backhead fittings, steam and safety valve cover, 4s. 6d. Sheet 7: brake gear and assembly, drain cock, hand pump and other minor fittings, 4s. 6d. Sheet 8: running-boards, splashers, injector water valve, sandbox and guard iron, footsteps, top feed connections and whistle, 4s. 6d. Send remittances to Percival Marshall Plans Service, 19-20 Noel Street, London W1. Prices include postage.

# SMALL SPRING PRODUCTION

By A. O. G. Usmar

SOME time ago a correspondent commented unfavourably on the performance of cold wound piano-wire springs when used in miniature locomotive suspensions. Although this method of spring production appears to receive wide favour, better springs, worthier of the usually fine examples of patience and high skill of which they are part, are only possible if they receive heat treatment after winding.

The simple heat treatment of cutting tools is widely known and even when indifferently done will produce an edge which is more or less satisfactory. But a slender spring requires greater temperature control than can be obtained by a naked flame and some knowledge of what takes place within the steel will be helpful if failures are to be avoided.

## Methods of hardening

There are two recognised methods of increasing the hardness of steel. One, known as workhardening, occurs when steel is deformed while cold. Any form of deformation which changes the shape without cutting it gives rise to an increase in hardness and with the highly susceptible steels even cutting pressure can give rise to an increase in surface hardness.

Coiling a spring produces this type of hardness which really involves stressing the steel beyond the limit of proportionality in order to obtain a permanent set to the coil. The metal has then entered the yield range and although a good quality steel still has a residue of elasticity, under load the yielding will continue to increase with eventual flattening of the spring.

The other type of hardening requires the application of heat to raise the

temperature of the steel above its decarlescence point, from which temperature, or preferably slightly below, it must be quenched in a suitable liquid. This heating is able to restore the inner structure of the steel after it has been deformed by winding and, providing the subsequent heat treatment is correct, the final spring will last indefinitely and not flatten if the loading does not stress it beyond its new limit of proportionality.

## Spring design

There are many standard references for spring calculations but most makers will prefer to experiment, taking as a guide the behaviour of a cold wound spring as an indication of its ability to stand up satisfactorily after heat treatment. A few experiments will soon give the experience required, not forgetting in the experiments, that diameter of coil as well as gauge affect the stiffness.

Assuming that the springs have been wound, a little preparation must be undertaken to ensure that the correct temperatures for success are obtained. Heating a coil spring in an open flame is unsatisfactory for the reasons which follow. Steel heated above 500 deg. C. undergoes internal changes; the crystals which comprise the structure are able to change their size and the larger they become and, of course, the fewer there are in number, the weaker the spring will be. It might be noted that this is also true for all steels although certain alloying elements have the ability to retard this effect.

This undesirable grain growth is related to the temperature to which the steel is raised and also, but to a much lesser extent, to the length of time it is held at the temperature.

An ordinary gas flame has within it a wide range of temperatures and to attempt to heat directly only

invites overheating of at least some of the coil. It is much better to take a little trouble, make a thick steel tube by drilling a piece of rod to fit the spring closely and then to heat this with the spring inside it and tip the spring into the quenching liquid as soon as the correct temperature is obtained. The "cherry red" heat of the tube must be judged in subdued daylight, certainly not in direct sunlight or a much higher temperature will be accepted as the correct one.

Soluble oil (10 per cent) in water makes a good quenching liquid. This leaves the spring black with scale and coated with a film of oil against rust.

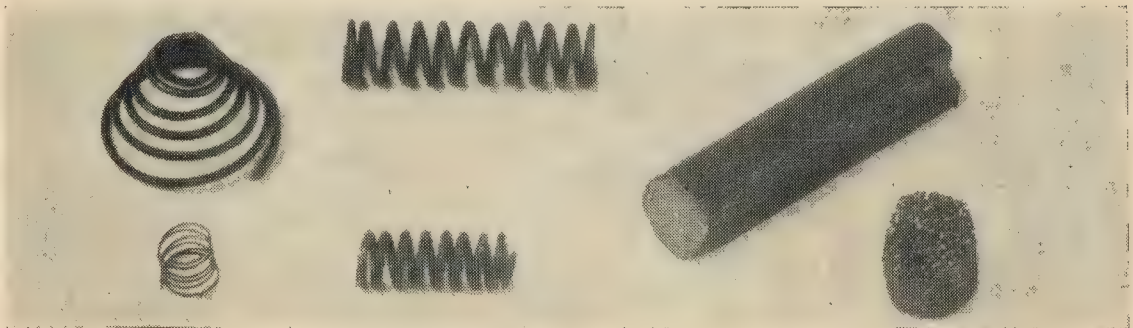
The springs should then be tempered and both for the sake of uniformity and quickness, this is best done by wiring them together in a bunch leaving enough wire to serve as a handle. Wire of the same gauge as the springs is most suitable.

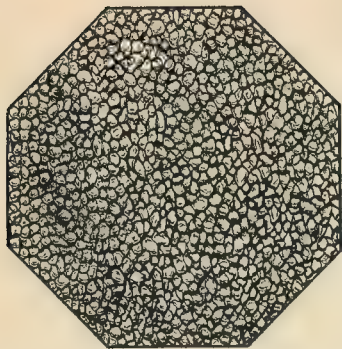
## Temperature guide

The recognised temper for a spring is blue, equivalent to 290 deg. C. A liquid bath is essential if the spring temper is to be uniform, but the lead bath sometimes recommended is not really suitable for the melting point of lead is 325 deg. C, well above the required temperature. Tinman's solder is much better, the 60 per cent tin, 40 per cent lead alloy has a melting point of 190 deg. C which allows a considerable margin in which to attain a completely fluid condition. A fairly large quantity should be used—at least a pound for very small springs, if on immersion the temperature drop is to be negligible.

The solder should be slowly heated in a ladle and when it is all liquid small pieces of bright steel should be floated on the surface. These will quickly reach the temperature of the bath and show it by the temper

*Examples of springs and (on right) steel test piece broken to show coarse grain as a result of overheating*





Artist's impression showing the grains—approximately 1/64 diameter—of grossly overheated steel

colours on their surface. When the correct temperature is obtained a trial spring should be held below the surface long enough for it to attain bath temperature, removed, quenched and quickly tried for springiness.

If the test is satisfactory the whole batch should be treated together.

Supposing that with every care the hardening or tempering temperatures are incorrect. What then must be done? For such a simple little thing as a coil spring, the best thing is to throw it away and start again. But supposing it is a spring of another kind, a carefully filed clock spring for instance. Need this be scrapped? The answer in this case is that it need not. If the overheating is in tempering it cannot be corrected by reversing the process, that is, stiffened up, but must go through the whole thing once more. If, on the other hand, the overheating occurred during the hardening, it is fortunate that reheating to "cherry red" will allow the inner structure to recover completely and quenching from this temperature will once more fix the structure desired.

For the reader who wishes to learn more of this fascinating subject W. Rosenhain's *Introduction to Physical Metallurgy* or E. Gregory's *Metallurgy* is recommended. ■

## Full-scale memorial

THE citizens of Calgary, in the mountains of Canada, have embarked on a large-scale scheme to preserve a memorial to the steam age. They have subscribed to a fund which will enable them to purchase one of the rapidly disappearing Canadian Pacific Railway 5900 Selkirk class 2-10-4 locomotives. These giant engines were the mainstay of services in that mountainous area until the advent of the diesel, but now, like so many other places in the world, steam is disappearing from the scene.

The cost of purchasing and providing accommodation for the locomotive amounts to \$15,000.

The 5900 class, weighing 220 tons and measuring 98 ft, was the largest oil-burning steam locomotive operated in the British Empire.

## BRITAIN'S FIRST 2,000 H.P. DIESEL

C. R. TEMPLE lists a few facts for modellers in search of details

**S**UPERSTRUCTURE of the locomotive shown here is semi-streamlined with a cab behind each nose-end compartment, within which the power unit, radiators and the main control cubicle are mounted. The radiators for water and lubricating oil are located on each side of the locomotive. They are cooled by a fan mounted on the roof and driven from the free end of the diesel engine through carden shafts and a gearbox.

The driving cabs have large front and side windows and an entrance door at each side. Access doors to the engine compartment are provided from outside the locomotive and from each cab. The locomotive underframe and body is formed of rolled steel sections welded together to form a single stress unit.

The engine fuel tank is located in the radiator compartment, the space between the bogies being used for underslung tanks carrying fuel and water for the train heating boiler. The power unit consists of an English Electric 16 SVT Mk II diesel engine with the main generator bolted solidly to the engine, the whole forming a compact and rigid unit. The auxiliary generator is overhung on the free end of the main generator. The unit is supported on resilient bearers so that normal flexing of the loco-



tive underframe does not set up stresses in the power unit.

Principal data: wheel arrangement, 1-Co-Co-1; weight 133 tons; adhesive weight 108 tons; max. axle load 18 tons; length over buffers, 69 ft 6 in.; overall width 9 ft 6 in.; overall height 12 ft 10 in.; bogie wheelbase, rigid 16 ft 0 in.; wheel diameter pony truck, 3 ft; driving wheel dia. 3 ft 9 in.; brakes, air (locomotive), vacuum (train); rating 2,000 h.p. at 850 r.p.m.; max. tractive effort 52,000 lb.; continuous tractive effort 30,900 lb.; max. service speed 90 m.p.h.; fuel tank capacity, engine 700 gallons, train

heating boiler, 200 gallons; min. curve negotiable 4½ chains; train heating boiler capacity 2,500 lb. per hour; water tank capacity, 800 gallons; water pick-up fitted.

By 1961 steam working will have disappeared at Liverpool Street station (except for some engines working in from the country) and completely at Stratford motive power depot (formerly the largest steam depot in the country). The Great Northern lines (suburban) into King's Cross will be changed from steam to diesel working by about 1963, pending electrification. ■

## TRIDENT MAJOR

**D**ETAILS of the end covers of the boiler, which were the last of the items to be modified, are given herewith. The end covers specified originally were flat plates shaped to the boiler barrel with the necessary holes for the stays and fittings. These were fitted flat against the end of the barrel, with a piece of asbestos millboard inserted at the combustion chamber end to provide added insulation.

The insertion of a sheet of  $\frac{1}{8}$  in. asbestos millboard on the *inside* of the rear endplate is strongly recommended, as experience has shown that considerable heat is wasted at this point, and in orthodox types of internal flue boilers, it is not uncommon for the uptake to get red hot. By conserving this heat and directing it through the return flues, the thermal efficiency of the boiler is greatly improved.

The new end covers were made from 16-gauge copper sheet and

over the stand pipes and stays until it rests against the end of the boiler barrel and then mark round with a pencil. After the shape has been marked and cut, the template is placed on the wood and the former marked out.

The template is not discarded at this point because it has a further duty to perform, that of making the position of the numerous holes in the end cover. When the flanging of the cover has been completed the template is laid inside in the same position as that occupied by the former, and the holes are marked accordingly. By

work is placed on the brazing hearth and after applying the necessary coating of flux where the joint is to be made, it is brought to the required temperature in the normal way.

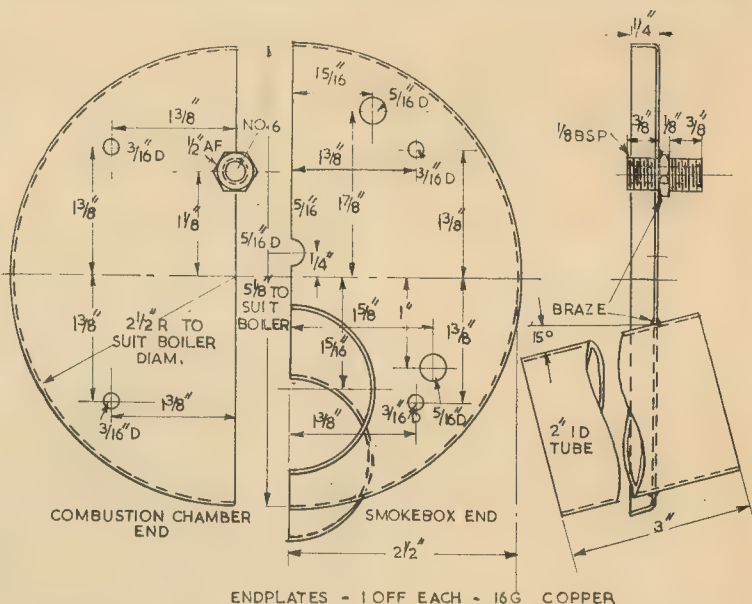
The brazing of the extension to the flue tube in the other cover is not quite so straightforward. This is due to the fact that the small extension tube is set 15 deg. off from the true right angles of the cover plate. To set the tube in its proper position, the hole in the cover plate is filed slightly oval and as a result a loose fit is unavoidable. The important point to watch is to see that the

The last article in the series on this unit, in which **EXACTUS** gives details of end covers and notes on the method of testing

flanged to fit over the outside of the boiler barrel. Two formers are required to make the end covers, a round one for the front and an oval one (owing to the 15 deg. angle of the boiler) for the rear. There is no point in spending a lot of time and effort in making these items from metal, since they are only for a "one off" job and formers made from hardwood will do all that is required.

The making of the former for the front end of the boiler presents no difficulty. It is a true diameter, and only requires straightforward turning in the lathe. The rear former entails a little more work as it has to be shaped by hand.

To ensure that it is correctly shaped, the first thing to do is to make a template from a piece of stout material. Thick cardboard is quite satisfactory. Fit it carefully



ENDPLATES - 1 OFF EACH - 16 G. COPPER

following this method, a neat fitting end cover will result.

The first cover has fewer holes—only those for the stays—but again a template can be used to assist in positioning the stay holes correctly.

There is a small brazing job to be done in both covers. The front cover has a union to one side of which the superheater is coupled, the steam pipe to the engine being on the other. In the rear cover, a short piece of tube which forms an extension to the flue tube, a modification mentioned at the beginning of these articles, is brazed.

There are no difficulties in brazing the union in the front cover. The

extension tube is in contact with the cover plate all round its diameter when it is in its final position.

The brazing of the tube into the cover can be done quite simply by fitting the parts over the boiler and using it as a jig. An illustration of the actual job being done appeared recently in the series on soldering and brazing [ME, January 8, p. 57]. It will be noted from this illustration that the boiler is propped up at an angle so that the top is level, to enable the filler metal to flow round the joint evenly.

This concludes the work to be done on the boiler, and brings me to the stage when it is prepared for hydraulic

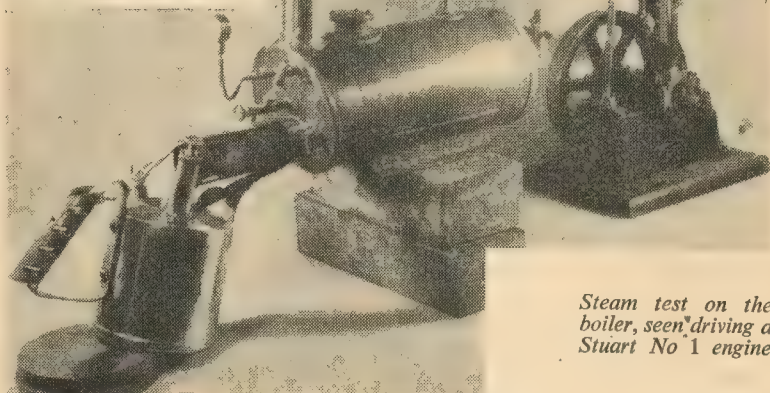
# MARINE BOILER

and steam pressure tests, in that order. The testing of a live steam boiler is an important operation, and one to which it should be subject at regular intervals. This being the case, and as this is a point on which readers often seek guidance, I think it worthwhile to give a short account of the procedure to be adopted.

The first test to which a boiler is subjected is the hydraulic test for assessing the strength of all parts under stress. The boiler should be completely filled with water, warm for preference, and all air excluded. The boiler is then connected to a hydraulic pump unit and if possible so arranged that it can be observed from all angles, particularly the underside. This will enable any little weep that may appear, to be immediately apparent, instead of it being brought to notice by water on the bench. Last week's issue contained an illustration of the Trident Major boiler taken during tests. It will have been noted that the boiler is mounted on a block to enable the underside to be seen without difficulty.

The pressure gauge shown in the illustration which was finally fitted to the boiler was being checked when the picture was taken. These gauges are not suitable for accurately testing a boiler, and one of larger dimensions should be obtained. Any doubts about the accuracy of the gauge should be checked before putting it to use.

I know of an instance where a gauge was checked, out of curiosity,



*Steam test on the boiler, seen driving a Stuart No 1 engine*

after it had been used on the hydraulic test of a boiler. The gauge was found to be registering 160 lb. pressure when the correct figure should have been 220 lb. Fortunately the boiler stood the strain and no harm was done. The gauge was tested by a local engineering firm.

The pressure to which a boiler should be subjected in a hydraulic test is usually  $1\frac{1}{2}$  times to twice that of its normal working pressure. I always test my boilers to twice the working pressure.

The pressure should be taken up gradually and in stages of roughly about 10 p.s.i. As each stage is reached an inspection should be made for weeps, leaks or failures in the material. These should be remedied before proceeding further with the test. When the maximum pressure is reached, it should be held in the

boiler for about 15 minutes. During this time it may be necessary occasionally to give a little extra pumping to make up for unavoidable leaks or weepings.

After the boiler has passed the hydraulic test satisfactorily, it can be given the steam test. This week's illustration shows such a test. The engine for which the boiler is producing steam is a Stuart No 1 with a 2 in. bore and stroke.

It will be recalled that in my first article I mentioned that we tried out different types of heating apparatus to see if there was any appreciable blow-back of the gases. But none materialised so we dispensed with the blower.

These particular circumstances only apply to this type of boiler and should not be accepted as a general rule. The conditions will vary considerably with the type of boiler and the fuel used to raise steam. For instance, a boiler fired by solid fuel will need the assistance of a blower of some kind to create a forced draught through the firebox.

Readers may have noticed that there is no feed water connection to the boiler in the illustration. This was omitted to give a clearer picture of the lamp and the general set-up for the test. It is, of course, necessary to have the boiler connected to a supply of water, particularly if the boiler is to be steamed for any length of time.

This concludes the series on the Trident Major boiler. It can be thoroughly recommended as a very efficient boiler and is easy to build. An announcement will be made as soon as the working drawings are available from our Plans Dept. □

## PERCIVAL MARSHALL PLANS SERVICE

### M2.—1/20 HP HOT-AIR ENGINE (HEINRICI TYPE)

**H**OT-AIR engines are becoming increasingly popular with our readers. We are often asked for a suitable design from which to build an engine that is something more than a "toy." We recommend our working drawings of the 1/20 h.p. hot-air engine (Heinrici type). It is of the "inverted vertical" type, and a set of two drawings was prepared by Edgar T. Westbury from the original Heinrici plans.

One drawing is a general arrangement of the engine showing two views and the other sheet shows all the details fully and clearly dimensioned. Castings are shown for some of the

parts, but if necessary these can be produced by the alternative method of fabricating.

A hot-air engine, properly designed and built to modern standards of accuracy, can develop a useful amount of power, and it is possible to propel a small boat with one of these units.

The drawings are in sets only. Sheet 1. General arrangement, Sheet 2. Details, 2s. 9d. (\$0.40).

Readers who wish the drawings sent by air-mail should add the following: America, Canada, South America, South Africa and India, 2s. (\$0.30).

Australia and New Zealand, 2s. 4d.

# READERS' QUERIES

DO NOT FORGET THE QUERY COUPON ON THE LAST PAGE OF THIS ISSUE

This free advice service is open to all readers. Queries must be of a practical nature on subjects within the scope of this journal. The replies published are extracts from fuller replies sent through the post: queries must not be sent with any other communications: valuations of models, or advice on selling, cannot be given: stamped addressed envelope with each query. Mark envelope clearly "Query," Model Engineer, 19-20 Noel Street, London, W.1.

## Electrical phenomena

When a person lies on a switched on electric blanket (as a sick friend of mine occasionally does) and any part of his body, e.g. forehead, is touched very lightly by a second person standing at the bedside, a minute tingling is felt by the latter. If the pressure is increased no tingling is felt. Why?

Why does an electric radiator in my possession emit a humming noise? It was designed, I understand, for continual running in, say, a bathroom or spare room to take the chill off the air in winter. It appears to be about  $3/5$  kw. The resistance element is wound on a porcelain cylinder  $3\frac{1}{2}$  in. dia. and 10 in. long. The element does not emit even a dull red glow. Again when touched very lightly a tingling feeling is experienced.

By the way, the element of the radiator is enclosed in a kind of iron grating as protection and I would say ideal for being set into vibration. The hum is practically constant, although the pitch varies up and down every few minutes. The radiator sits on a floor covered with linoleum. Putting strips of wood, etc., underneath does not prevent the noise.

I am aware that the molecules of the element move more quickly when the heat is on, but then other radiators do not have a hum! The source of supply is a.c., 240 v., 50 cycles.—D.V.E., Crosby.

▲ *Electric blankets and other apparatus are not all earthed. The apparent feeling of a slight electric shock can be due to one of two causes. It is possible that at warming up the blanket may sweat slightly, and a small leakage current is present on the covering. This leakage may be of so small a value that it is not sufficient to give a person a shock in the accepted sense. On the other hand it could be what is known as static, or the condenser effect. This gives something of a more or less rubbing feeling, in the same way as lemon juice would do on the finger if it were rubbed round the top of a glass. This effect is found in much alternating current apparatus and is in no way dangerous. Increasing the area of contact by pressing hard, or placing a greater amount of the general body on the apparatus cancels the feeling.*

*The humming noise with the convector type of heater can be due to a number of things. There may be a loose connection somewhere in the heater, or a loose nut or screw in the general structure vibrating in sympathy with the supply frequency. It could also be due to loose turns of the heating element wire on the former. Sometimes these low temperature heaters have their formers supported by iron rods and this could cause the noise. Sometimes the frequency is picked up from the metal structure itself. In some cases the humming usually disappears after the heater has reached full temperature. Quite a number of radiant fires will do this until the element is glowing to full brightness.*

*The fault can be traced and cured, but this is not a job you could do yourself. It needs a qualified electrician to carry out this rectification, because it has to be done with the apparatus alive. Are you, by the way, using this heater in a bathroom, and feeling this slight shock effect? If this is the case the earthing of the installation is at fault somewhere and we strongly advise that this matter be investigated in the interests of safety.*

## Castings for Virginia

I would like to build Virginia in  $4\frac{1}{2}$  in. gauge, and finish it off like CPR No 29. In this connection I would appreciate it if you could suggest stock components (castings) of other engines I could work in. My aim is for a passenger hauler, not a replica model.

Have you heard of anyone selling castings for Virginia in a larger size? Or have you heard of anyone building a similar engine to this size, with whom I could correspond? I have been chasing through ME and can only find one similar engine and that is by Bill Van Brocklin. However, that is  $3\frac{1}{2}$  in., I think.

If the answers to the above are negative, would you recommend scaling up just about everything of the working parts by four-thirds?

Having built two engines (*Juliet* and *Bantam Cock*), I feel sufficiently experienced to proceed on this basis if you think the idea is sound, but would like confirmation before beginning.—F.M., New Brunswick.

▲ *We do not know of any castings available suitable for a  $4\frac{1}{2}$  in. version of VIRGINIA. However, certain castings might be adapted, such as wheels used on the MAID OF KENT, also the outside cylinders, axleboxes, horns, etc.*

*Regarding castings for chimney, dome, etc., several of our regular advertisers might be willing to cast these for you.*

*Your suggestion that the  $3\frac{1}{2}$  in. gauge drawings could be scaled up, is sound up to a point, but the boiler would need redesigning, as a greater number of tubes and stays is desirable. If you care to make a rough drawing of a proposed boiler design and forward it to us, we should be pleased to go over it.*

## Passenger-carrying truck

I would be grateful if you would send me information about the construction of a passenger-carrying truck for a  $3\frac{1}{2}$  in. gauge miniature railway.

If you cannot do this, would you please give me the name of any books which may help me?—C.D., London, NW5.

▲ *We are unable to supply any constructional information regarding a passenger-carrying truck for  $3\frac{1}{2}$  in. gauge. You can obtain drawings, castings and parts for such a truck from A. J. Reeves and Co., 416 Moseley Road, Birmingham 12.*

## Locomotive plans

I am building an Atlantic 4-4-2 in 5 in. gauge and as I proceed with the construction I find that there are constant hold-ups due to lack of information. Plans have been purchased from Bassett-Lowke, some of which are the original copies dated 1910 by H. Greenly.

Has Mr J. N. Maskelyne any general arrangement drawing of this locomotive? If any such drawing is available, it would be a great help. The locomotive is GNR, outside cylinders, with slide valves and Stephenson's link motion.—A.B.S., Mansfield.

▲ *We do not know the 5 in. gauge Atlantic design to which you refer, but as it is one of Henry Greenly's designs, you should be able to get any*

necessary information about it from Greenly and Steel, 6, Summerleys Road, Princes Risborough, Bucks.

### Haltan tank loco

Having been most impressed by the fine proportions of the late Mr Hebblethwaite's Haltan tank in 5 in. gauge I set about trying to find drawings, etc., but without success.

Are castings and drawings available for this locomotive?—G.P.D., Orpington.

▲ We think you will be able to obtain castings and drawings for the 5 in. gauge Haltan tank locomotive from Greenly and Steel, 6 Summerleys Road, Princes Risborough, Bucks.

## The date of this year's MODEL ENGINEER EXHIBITION

30 Dec. 1959—9 Jan. 1960

### Lightweight transformer

I would be glad of your advice in connection with the construction of a transformer, the basic details of which are as follows:

Input 50 cycles a.c., 200 to 250 v. with tapplings at every 10 v. between those limits, output 50 v., 250 w. or 100 v. 300 w. These will not be required at the same time.

The crux of the problem is weight as the transformer will have to be carried with other equipment, and I believe that this can be done by "auto-winding." I should like to have your advice, therefore, on core dimensions and wire sizes, etc., for the various parts of the winding.—E.F.B., Beckenham.

▲ Little is to be gained with an auto-transformer of this size as far as weight is concerned. Where a low voltage supply is of a portable nature, the regulations for safety require that the secondary must be earthed and an auto-transformer would not comply with these rules. We suggest that the better plan would be to wind your transformer for one voltage only, i.e. 100 v. By doing this you have a choice of the two voltages you need, and the earthing is easily dealt with. There would be little difference as to wire weight for the lower voltage. Unfortunately you do not state the rating of the transformer, but we assume it would be for continuous use. This factor affects the weight of the iron, and wire.

A transformer to suit your purpose may be as follows: a core area of 3.5 sq. in. is necessary with a limb length of approximately  $2\frac{3}{4}$  in. Standard stampings are available for this. The primary will be wound with 575 turns of 22 s.w.g. plain enamel covered copper wire. Tappings should be brought out at 460, 483, 506, 529 and 575. This will give the voltage range between 200 and 250. The secondary will be wound with 230 turns of either 17 or 18 s.w.g. plain enamel covered wire for 100 v. A tapping should be taken at half this value, so that you will have 50 v. The centre tapping is earthed to the ironwork of the transformer which, in turn, is earthed to the earth system of the supply. The effect of this is to limit the breakdown voltage to 50 v. to earth should a fault occur, or the leads be accidentally handled. The turn value will be the same for the 50 v. arrangement.

A bobbin should be made for the coils, which will occupy the centre limb of the iron. This can be made from sheet fibre or any suitable insulating material. The insulation between the primary and secondary windings should be to 20 mil. thickness of leatheroid or thin sheet fibre. This should be cut so as to be slightly wider than the winding space, so that it butts well up to the sides of the bobbin. Protective sleeving should be put over the inner and outer ends of the primary winding. The tap should be treated in the same way. The simplest way to bring out the tap is to lie the wires at the tap position flat on the winding with a strip of insulating material between, bring the tap out at one side and continue the winding over this.

### Prototype drawings

I am involved in building a 10½ in. gauge Royal Scot and am using castings and drawings by Bassett-Lowke. Although I have the full set of 20 drawings by Greenly, the detailing is not sufficient for the building of a model of this size, and far too much of the detailing is left either to free-lance or to the model maker's knowledge of locomotives. Bassett-Lowke cannot help with any further information and I wondered whether you could help me in this direction.

Failing everything else, is it possible to obtain from BR a set of prototype drawings, and have you any idea as to the cost?—J.B.R., Norfolk.

▲ You should be able to obtain the required drawings of the Royal Scot from the Publicity and Public Relations Officer, British Railways, London Midland Region, Euston, London, NW1. We do not know the charge but would say that sufficient drawings might cost between £2 and £5.

Whether the full size drawings will really help you is another matter. If you are in difficulty over any particular details, perhaps you would let us know, and we shall be pleased to give you any assistance we can.

### Spare parts

I should be pleased if you could give me the name of some firm or firms who supply spare parts for a O gauge model steam engine.—J.P.C., Bristol.

▲ You will have some difficulty in finding anyone to supply spare parts for O gauge model steam engines, but we suggest you try Bassett-Lowke Ltd, 18-25 Kingswell Street, Northampton, and Bond's o' Euston Road Ltd, 357, Euston Road NW1.

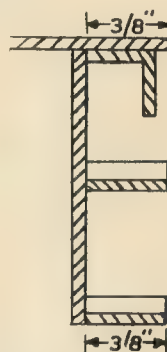
### Drawings for Molly

I am building LBSC's Molly, to drawings bought from your offices, and would appreciate your help on the following points.

(a) Where can I get backhead arrangement, boiler fittings and injector details?

(b) Is the chimney as shown correct with no petticoat pipe?

(c) What are the dimensions of:  
(i) The step projection from the step backplate? (ii) The distance from the step backplate to the beaded edge of the running plates?—J.M.H., Londonderry.



▲ The set of drawings for the locomotive MOLLY does not include a view of footplate and backhead fittings. These have been described many times by LBSC and others in ME. If you are in doubt, we think that the drawing L072/7 price 3s. 6d. would help you. This shows the backhead of an LMS class 5 4-6-0 which, though larger than MOLLY, is of similar shape.

The chimney does not have a petticoat pipe in this design. We cannot say the exact depth of the steps but would estimate this at  $\frac{3}{8}$  in. for a  $\frac{3}{4}$  in. scale model.

# POSTBAG

The Editor welcomes letters for these columns. A PM Book Voucher for 10s. 6d. will be paid for each picture printed. Letters may be condensed or edited.

## OLD AND NEW

SIR,—I took the trouble to go through my back copies of ME (since 1937, roughly) to see what we were missing, if anything. I find that the new MODEL ENGINEER is every bit as good as the old one especially as you have new writers for locomotives of the calibre of Martin Evans. On locomotives LBSC is tending to live on his reputation in the past, which, when one reads the older articles, is good. He has done all he claims to have done and I do not wish to detract in any way from his honours. But we in the colonies are not interested in the old fashioned locomotives.

I hear that he is to describe another old-time singlewheeler—but why? We are not living in the past and surely your overseas subscribers count for something? That is another rather pleasing (to me anyway) aspect of the new ME. More notice is being paid to your overseas correspondents. There have been a couple of South African efforts described lately and also some very interesting American efforts. Keep it up. The more variety the better.

East Rand,  
Transvaal,  
South Africa.

W. DONNELLY.

## MARINE ENGINE

SIR,—In ME for January 15 is shown a compound marine engine, by J. Jaques, of Boston. This is not my engine, and I do not wish to be given credit for a fine engine I have not made.

Boston

R. JACQUES.

## JAYWICK MINIATURE

SIR,—The engine purchased by Mr Bird is no doubt the one that worked the Jaywick Railway. I saw it there in 1935 or '36.

The engine was built by students of the Regent Street Polytechnic in, I believe, 1903. A photograph and description of the Polytechnic workshop appeared in ME and the engine under construction could be seen at the back of the workshop.

I attended the Polytechnic in 1904. The engine was then in a corner of the gymnasium, I think it was removed about the end of the year and I did not see it again until my visit to Jaywick.

I knew it was the Poly engine as there were one or two features about it which stuck in my mind as not being Patrick Stirling. The smokebox was too high above the boiler cleading which, I thought at the time, spoiled the outline of the engine. This I noticed again on seeing the engine at Jaywick.

Luton.

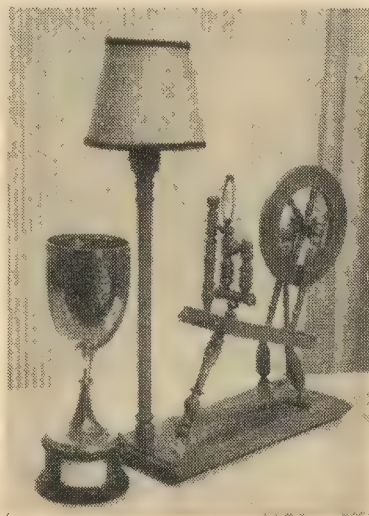
H. D. BOND.

SIR,—As a result of the publication of our inquiry in your correspondence columns we have had interesting and helpful letters from Messrs G. Woodcock, Norman Gardner, G. H. Naylor, Charles Simpson and C. F. Parsons. The information contained in these letters is now being analysed and it is hoped to prepare a complete history of the miniature Stirling single locomotives in due course.

I am most grateful to those who have helped us in our research in this matter.

Stafford.

W. A. SMYTH.



## PRIZEWINNER

SIR,—I enclose a photograph of the spinning wheel model with which I took first prize and silver cup at a recent exhibition held by the Grimsby Society of Model and Experimental Engineers.

NORMAN WILLESTON.

## SPEED BOAT CONTEST

SIR,—At the annual meeting of the Model Power Boat Association, a resolution was passed concerning the MODEL ENGINEER Speed Boat Competition, and I have been asked to write to you and pass on the suggestion.

It appears that there are a number of enthusiasts who would like to enter for this competition but who are at the moment ineligible because a ready-made engine is used for the power plant. The suggestion is that a section could be created for those who make the hydroplane hull and fittings but not the engine.

May I add a personal suggestion? If the rules are arranged to include the above category, it might be advantageous to open the competition to foreign entrants also. I have the American enthusiasts particularly in mind. Since the competition is now no longer decided on speed alone, there would be less likelihood of British entries being frightened off—American speeds are, in general, a bit higher than ours.

I hope you will find the above suggestions of interest, for it is the earnest desire of the MPBA that the Speed Boat Competition should flourish, and you may be sure that we will encourage our hydroplane members to enter.

Sawston.

JOHN H. BENSON.  
Competition Sec. MPBA.

● The main object of this competition, which was first instituted over 50 years ago, has always been to encourage experimental work in the design of fast model boats, including both engines and hulls. The annual reports of the competition, with photographs and statistics of the boats entered, have been an epitome of progress and a mine of useful information to prospective constructors.

In recent years there has been an unaccountable falling off of interest in the competition. While we are as anxious as our readers to keep it going, it is not easy to see how the aims outlined above would be better served by drastic alterations in the rules, which have already been modified several times to keep them in line with modern developments.

If readers would like the scope of the competition widened by concessions to entrants who do not build their own

engines, this will be given careful consideration. But it should be noted that it would necessitate placing such entries in a separate class. The deciding factor is whether sufficient support would be forthcoming to run what is, in effect, two separate competitions each year. Foreign entries might involve some complications in classification and methods of timing.

We should welcome the views of readers on this question. Meanwhile we would remind them that the closing date for the 1958-9 competition is March 31. Entry forms can be obtained from this office on receipt of a stamped addressed envelope.—EDITOR.



## DERELICT ENGINE

SIR,—This Marshall traction engine was seen in a derelict condition on a farm near Epworth, Lincs. Stratford-on-Avon. G. ENGLAND.

## WATER POWER

SIR,—Another old book which may give J. G. Young, of Dunfermline, a fair amount of information about water wheels [Postbag, December 25] is *Mechanical Philosophy* by Mitchell, Young and Ismay published in 1856 by Houlston and Stevenson, 65 Paternoster Row and Wm S. Orr and Co., of Amen Corner. Among many other things, this book contains a section on water power, water wheels, turbines and hydraulic power, etc.

Although this book is not now commonly found, a copy may be obtained from one of the better known secondhand book sellers or from a reference library. Okehampton. G. F. BEASLEY.

## STEAM ON THE ROAD

SIR,—The query from a Queensland reader on steam motor-cycles [Postbag, November 6] has not so far had a very wide response. First, let us clear up the matter of those mythical 100 steam motor-cycles. The point has been raised before, and the ex-

planation is that other forms of transport are included in the same category.

It is curious that so little has been done in this line. Going back to 1896, one of my friends remembered the Dalifol steam bike in the emancipation run, running slowly and puffing out clouds of steam. It was a clumsy elephant of a bicycle with a double-acting slide valve engine driving direct on to the back wheel. The feed pump was on the other side. It had a coke-fired flash-boiler and would run seven to ten miles on one firing. Had it had a liquid-fuel burner and better workmanship and design, I think it might have been quite successful.

In the 90's the French, who were then leading in making cars, were abandoning steam and taking to internal combustion. Gone were the neat little direct-drive steam tricycles of De-Dion—replaced by his motor-tricycles and cars. The direct-driven bicycle is not recommended for amateurs as it involves too much reconstruction of the rear part of a motor-cycle frame.

The Turner-Miesse company is believed to have experimented with a steam bicycle in 1902. In this case a small single-acting engine was fitted horizontally over the back wheel.

The Pearson-Cox steam bicycle appeared on the market late in 1912, and it is on the lines of Mr Cox's design that a successful machine could be built. It had a single cylinder single-acting engine,  $1\frac{1}{2}$  in. bore  $\times$  2 in. stroke, gear  $3\frac{1}{2}$  : 1 to the back wheel and low down in front a flash-boiler of 65 ft steel tube  $\frac{1}{4}$  in. bore.

Another steam bicycle was described in ME—sometime in 1917, I think. It was built by Mr W. Taylor on the frame of a four-cylinder F.N. and had a single cylinder double-acting launch engine,  $2\frac{3}{8}$  in. bore  $\times$   $2\frac{1}{2}$  in. stroke. The boiler was a vertical multitubular 9 in. dia. and 12 in. high with 120  $\frac{1}{2}$  in. tubes. I think it averaged 20 m.p.h., which I consider was good as the engine was by no means a suitable type for motoring.

Mr Hindle's design published in ME on 11 April 1918 appears to be very good indeed and it is to be regretted that no firm was enterprising enough to put castings on the market. Apart from its use as a bicycle, it would have made a useful steam power unit. Salient features of Mr Hindle's design were: 1. Two cylinder, single-acting engine  $1\frac{1}{2}$  in.  $\times$  2 in., ratio 5 : 1 for sidecar work; 2. Inlet valves  $\frac{7}{16}$  in., exhaust  $\frac{9}{16}$  in., lift  $3/32$  in.; 3. Water pump, half engine speed, bore  $\frac{5}{8}$  in., stroke variable from 0 to  $\frac{5}{8}$  in. For the flash-boiler 70 ft of steel tubing was suggested.

In the light of more recent exper-

ience, one might suggest uniflow ports for the exhaust and a small exhaust valve to release the compression at starting and at low speeds. It will be noted that the valves are small in comparison with those of a petrol motor, but do not attempt to enlarge them. I heard recently of a steam car with big valves, designed by a petrol motor expert. The acceleration was terrific, but the valve gear would not stand up to the racket of working against high steam pressures and the car failed.

With discretion, a petrol motor can be adapted for steam by fitting a special cylinder. The danger is that the high steam pressures that are so easily produced may break the connecting rod and may also produce excessive bearing wear. A friend had a 20 h.p. Stanley to which he fitted a coach built body. There was power enough in the steam cylinders, but he had connecting rod failures.

Woking.

H. E. RENDALL.

## GAUGE O BOILER

SIR,—With reference to the query about the O gauge boiler [ME, January 15] designed by Mr E. J. Cooke about the year 1937.

It may interest your querist to know that such a boiler was made to the drawings and brazed with a one-pint blowlamp. I have it now in my workshop. It steamed OK with a vaporising spirit lamp, but as the locomotive was never completed I don't know how it would show up on track test. One great fault I found was priming. The water was never very steady in the glass, also water capacity was rather small for the size of the boiler.

Having been a follower of LBSC since 1926 and having built several boilers to his design and instructions, which have all been good steamers, I can heartily recommend our friend to fit his engine with the *Netta* boiler and guarantee results! Redruth. R. W. HAYNES.

## THREE-WHEELER SPECIAL

SIR,—I have a three-wheeler special which I must dispose of due to lack of time to complete it. The frame is of aircraft steel tubing and is light and rigid. The front suspension is independent and from a Cooper racing car, the engine is a 1948(?) Ariel Square Four which has been completely reconditioned and has new electrics. The engine, gearbox and clutch are all mounted at the rear and rear suspension is by swinging fork.

If you know of any enthusiast with plenty of time who wants cheap transport then I would part with it

## POSTBAG . . .

for £30 o.n.o. which is far less than it cost. The vehicle is actually in the London area and delivery could be arranged.

I must thank MODEL ENGINEER for interesting reading and please may we have a little more on i.c. engines? I work on the development of high speed diesels and the troubles encountered are sometimes very strange. I feel that model engines must also have their share of trouble and I would like to hear of them and the way they are overcome.  
Peterborough. JOHN J. WRIGHT.

## RUBBER BELTING

SIR,—In response to a recent inquiry by a St Albans reader [Queries, January 22], round rubber belts can be obtained in various sizes up to 8 in. o.d. from most stockists of electrical appliances. These belts are manufactured for driving vacuum cleaners, and are of hard rubber with very little stretch. I used the largest obtainable size for the countershaft of my Adept lathe and found it superior in every way to round leather belt.

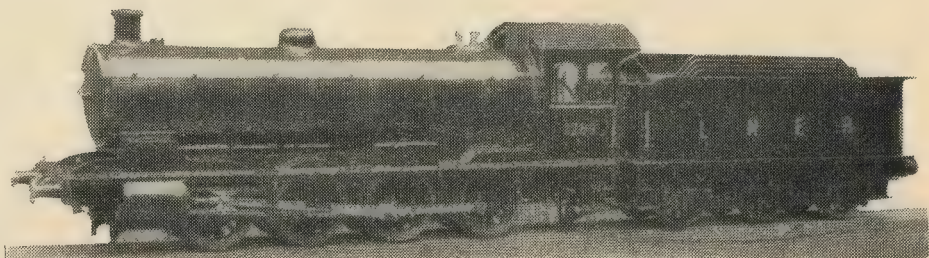
For an efficient drive from the flat belt wheel of a model stationary engine, high-pressure rubber rim tape, obtainable at all lightweight cycle shops, is ideal, using a stitched joint.

demonstrate how and why lock nuts work.

Locking as applied by Mr Abbott, does not work for the reason that where a lock nut is needed, the bolt is liable to stretching during work. It is during this rebound that the nut is free to turn. It is thus necessary for the second nut to be still forcing the first nut against its threads in the opposite direction when the bolt is fully stressed.

When I was serving my time, my chief draughtsman used to say two systems should be used: 1. As just outlined for fixing items not liable to adjustment, and 2. With two thick nuts for items needing to be taken apart frequently, the idea being that a

*This 3½ in. gauge T2 0-8-0 built to ¾ in. scale is referred to in the letter from Mr J. W. Moon, of Middlesbrough, printed below*



## T-CLASS 3½ in. GAUGE

SIR,—Recent correspondence about the NE T-class 0-8-0, prompts me to add further information which may be of interest.

My late father commenced building a T2 0-8-0 in October 1949 to a scale of ¾ in. and gauge 3½ in. During conversations about live steam topics he often referred to Mr P. T. Atkinson and his T-class 3½ in. gauge project, and I believe that the idea for building the T2 germinated from discussing the subject with Mr Atkinson.

The model was successfully tested on a 220 yd continuous track during October 1952, and completed during the following summer. It was, in fact, hauling passengers before the *Netta* series commenced.

An interesting feature was that my father was driving the prototype (among other full sized locomotives) at that time—the prototype being British Railways Q6 63389, formerly LNER T2 2289.

As an enthusiastic novice engaged on building *Rainhill*, my interest in the progress of the T2 was tremendous. I took notes and data during its construction, in addition to acquiring two photographs.

Since my father's death, the model has unfortunately passed out of my control, leaving me with the notes and photographs, one of which is enclosed.  
Middlesbrough. J. W. MOON.

I used a belt of this kind for driving a modified cycle dynamo from the flat rim of my Stuart No 10H, and can vouch for its suitability for this purpose, very little tension being required.  
Swansea. C. P. KINGSTON.

SIR,—The Lister Co., of Dursley, Gloucestershire use a ring of the approximate sizes required. These are used to seal the cylinder sleeves from the cooling water on their diesel engine.  
Basingstoke. TREVOR WHITAKER.

SIR,—I think possibly K. R. Whiston's black plastic belting would meet this reader's requirements unless rubber is absolutely essential. Mr Whiston lists the sizes mentioned and it has a certain amount of stretch. Joints are easy and permanent if made in accordance with instructions.

I have been using a ¼ in. belt of this material on a ¾ in. drill for two years with no trouble whatever.  
Stamford. J. T. BEATON.

## FITTING LOCK NUTS

SIR,—With reference to Mr R. Abbott's letter concerning K. N. Harris' views on how lock nuts should be placed [Postbag, January 15]. I wish to point out that Mr Harris is correct. The matter can be easily understood if one draws out the screw threads with a slack fit to

thin nut was worn away too soon, both thread and its flats and thin spanner.  
Dolgelley. J. P. RICHARDS.

## PERIOD CASE *continued from page 257*

### SYNOPSIS OF SERIAL

#### The Clock

Part 1. 27 Sept. 1956. Making the pendulum and the movement frame of the clock.

Part 2. 11 Oct. Pillars, wheel cutting and the three driving barrels.

Part 3. 25 Oct. Details of the centre wheel, third wheel and escape wheel and pinions.

Part 4. 8 Nov. Pivoting the arbors and use of the depth tool.

Part 5. 22 Nov. Motion work and adjustable pendulum crutch.

Part 6. 6 Dec. Hour bridge and the chiming and striking train.

Part 7. 20 Dec. Musical train.

Part 8. 3 Jan. 1957. Vertical fly and musical barrel.

Part 9. 17 Jan. Plate and hammer springs and musical hammers.

Part 10. 31 Jan. Chiming sequence.

Part 11. 14 Feb. Various levers, weights and pulleys.

Part 12. 28 Feb. Plotting the chimes on the chime barrel.

Part 13. 14 Mar. Some queries answered.

#### Clock case

Part 1. 1 Jan. 1959. Constructing the trunk.

Part 2. 15 Jan. Making the base and feet, how to fix them to the trunk and how the moulding is prepared and veneered.

Part 3. 29 Jan. Making the hood and front of the frame. Constructing a plaster of Paris moulding for arch.

12 Feb. Making the roof, pillars and brass, fitting roof to the hood.

26 Feb. Engraving the lettering on the face. Filling in the dial, silvering the chapter ring, and other final touches.

# CLUB NEWS

Send news and notices to  
The CLUBMAN, 19/20 Noel  
Street, London, W1.

## FIRE AT RUGBY

**F**IRE which broke out in a wood-yard and storehouse near the Rugby Model Railway and Engineering Society's premises in Kimberley Road, caused the main building of the yard to collapse in flames. It fell partially on to the society's outdoor multi-gauge passenger carrying track which, at that point, runs along a 5 ft 6 in. high viaduct. It is estimated that over 100 ft of track were damaged or destroyed. The shed housing the riding cars, two petrol locomotives and a considerable amount of fuel, escaped with minor blistering of the paintwork.

If the track is to be repaired for summer traffic an all out effort will have to be made by all members.

## WEST MIDLANDS CLUB ?

Mr W. A. Richards, of Birmingham, tells me of a proposed West Midlands 7 mm. Model Railway Society which he is intending to start in the near future if sufficient support is forthcoming. It is his hope that the society will hire or purchase a clubroom in which a layout could be constructed.

Anyone interested should contact Mr Richards at 28 Broughton Street, Lozells, Birmingham.

## SUSSEX LOCOS PAY

Sussex Miniature Locomotive Society, which operates the well known Beech Hurst track at Haywards Heath, has what must be a unique installation, in these days of nationalisation—a railway that pays. Accord-

colour lighting signals. At one point a sturdy traverser has been built so that the engines can be manoeuvred from the steaming bays to the track.

The Sussex Society has decided to paint the engine presented to it by the widow of the late Mr W. M. Hebblethwaite, of Ringmer. The engine, which was awarded a silver medal at the last Model Engineer Exhibition, is now being prepared for its steaming trials.

## HASTINGS NEW CLUBROOM

A little less TV please! The plea, so often uttered since the advent of the magic one-eyed box, has recently been made again by Hastings SMEE. Now that they have their new clubroom, thanks to British Railways, there can be no excuse for not attending meetings more regularly. Members are reminded that if the society is to open its track on Whit Monday as hoped, they must all put in a lot of work. So out with the tools Hastings!

Hastings SMEE offer all interested societies the opportunity to partake of their live-steam facilities. They particularly ask for support from other organisations at Whitsun for their grand opening. All societies interested should contact the secretary (Mr C. Parslow, rear 106 Bohemia Road, Hastings), as soon as possible.

## N. LONDON'S STEAMING BAYS

The North London SMEE track at Arkley has installed new steaming bays, which, in spite of bad weather which hampered attempts at con-

creting, are now virtually complete.

One of the best meetings in past weeks has been the talk in the locomotive section by an ex-LMS driver, Mr Earle, who spoke of some of his fast runs when he was in charge of the *Royal Scot* and other fast trains before his retirement in 1946.

## VANDALISM AT WIGAN

Due to damage to the club's track Wigan Model Engineering Society

has found it necessary to raise the subscription rate to 15s.

The society's treasurer, Mr G. Lloyd, has retired after holding the post for many years. He is succeeded by Mr D. Slater who was a founder member of the society.

Mr C. H. Noble, who has been ill, has now recovered and resumed his duties as president.

## DOWN UNDER

The photograph on this page of two *Juliets* and a *Tich* was sent to me by Mr T. E. Buckingham, of South Australia. Constructed by members of the South Australian Model Engineering Society, they show that LBSC's engines remain as popular in Australia as they do here.

## Changes of address

**Crosby Model Club.** "Colnsay," Crosby Road South, Crosby.

**West Riding Small Locomotive Society.** Sec./treas. Mr R. Wilson, "Althone," 38 Rein Road, Morley, Yorks.

**Hastings SMEE.** "Welfare Room," Down Platform, St Leonards Warrior Square Station.

**Rugby Model Railway and Engineering Society.** Secretary, Mr J. F. Brown, 24 Worcester Street, Rugby.

**Road Locomotive Society.** Secretary, Mr W. J. Love, 136 Lavender Hill, Tonbridge, Kent.

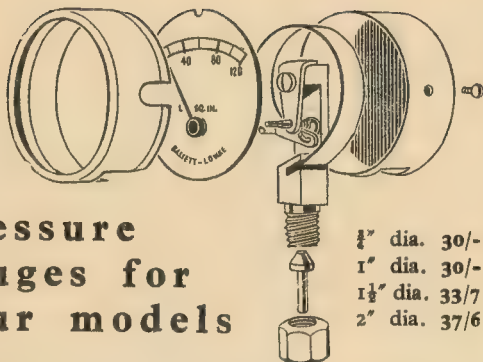
## CLUB DIARY

- Feb. 27 Dublin SMEE.** History of the society at Herbert Park, Mr Tramp.
- Feb. 27 JIE.** "Computers and Materials Handling," W. J. Kease and A. C. Quarterman, Pepys House. 7.0 p.m.
- Feb. 27 Thames Shiplovers.** The Story of J. Samuel White and Co. Ltd, by R. Allen, a director.
- Feb. 27 Greenwich and District SMS.** Draughtsmanship: talk by G. Gardiner.
- Mar. 3 Acton MES** annual meeting, Headquarters, Acton. 8.0 p.m.
- Mar. 3 Hastings SME.** Loco overhauls. Welfare Room. 7.30 p.m.
- Mar. 3 Sutton Coldfield and North Birmingham MES.** Surprise night.
- Mar. 5 Worcester and District MES.** BR Diesels: lecture and discussion.
- Mar. 5 Huddersfield SME.** Joints in model boilers, talk by Mr H. Smith, Highfields. 7.30 p.m.
- Mar. 5 Hull SME.** Building a Stirling Castle, Mr Proud.
- Mar. 5 Hitchin and District MEC.** "My job": talk by Mr S. W. Cull, loco foreman, Hitchin MP Depot.
- Mar. 5 Rugby Society of Model and Experimental Craftmen.** Film show at Percival Guildhouse, Rugby. 7.30 p.m.
- Mar. 5 Eltham and District Locomotive Society.** Meeting: Talk by Mr Watson on "Experiences as a locomotive fitter on the Gas Board, Beehive Hotel, Eltham. 8.30 p.m.
- Mar. 6 Ramsgate and District Model Club.** Meeting at Effingham Street, Ramsgate. 7.30 p.m.
- Mar. 6 N. London SMEE.** General meeting, E.R. Gas Offices, New Barnet. 8.0 p.m.
- Mar. 6 Junior Institute of Engineers.** Film evening, films by Bowater Paper Corp. Ltd, introduced by Mr A. Tout. Pepys House, 14 Rochester Row, Westminster, SW1. 7.0 p.m.



ing to the *Mid Sussex Times* over 11,000 fare-paying passengers were carried and during the past five years they claim to have conveyed over 36,000. Can any other society claim a record like that?

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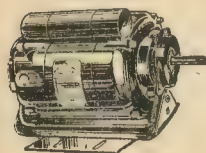
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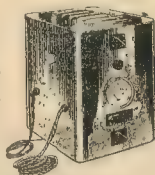
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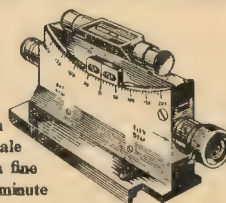
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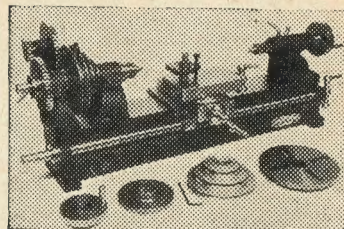
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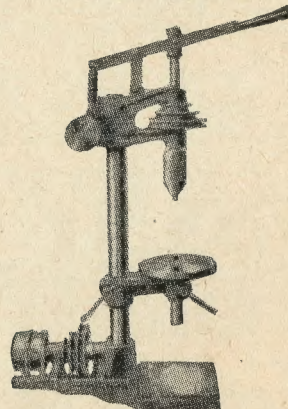
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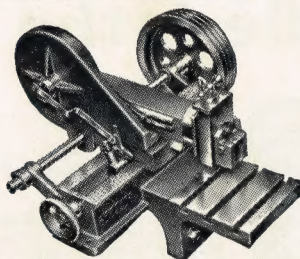
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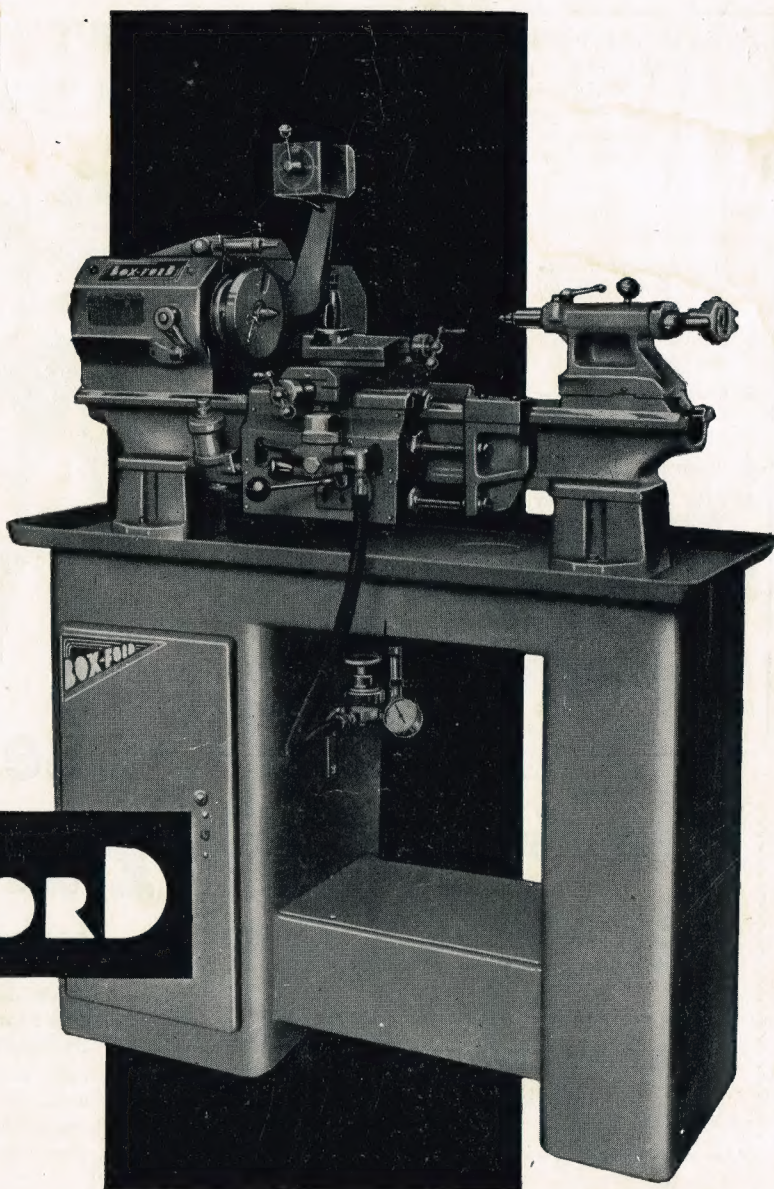


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